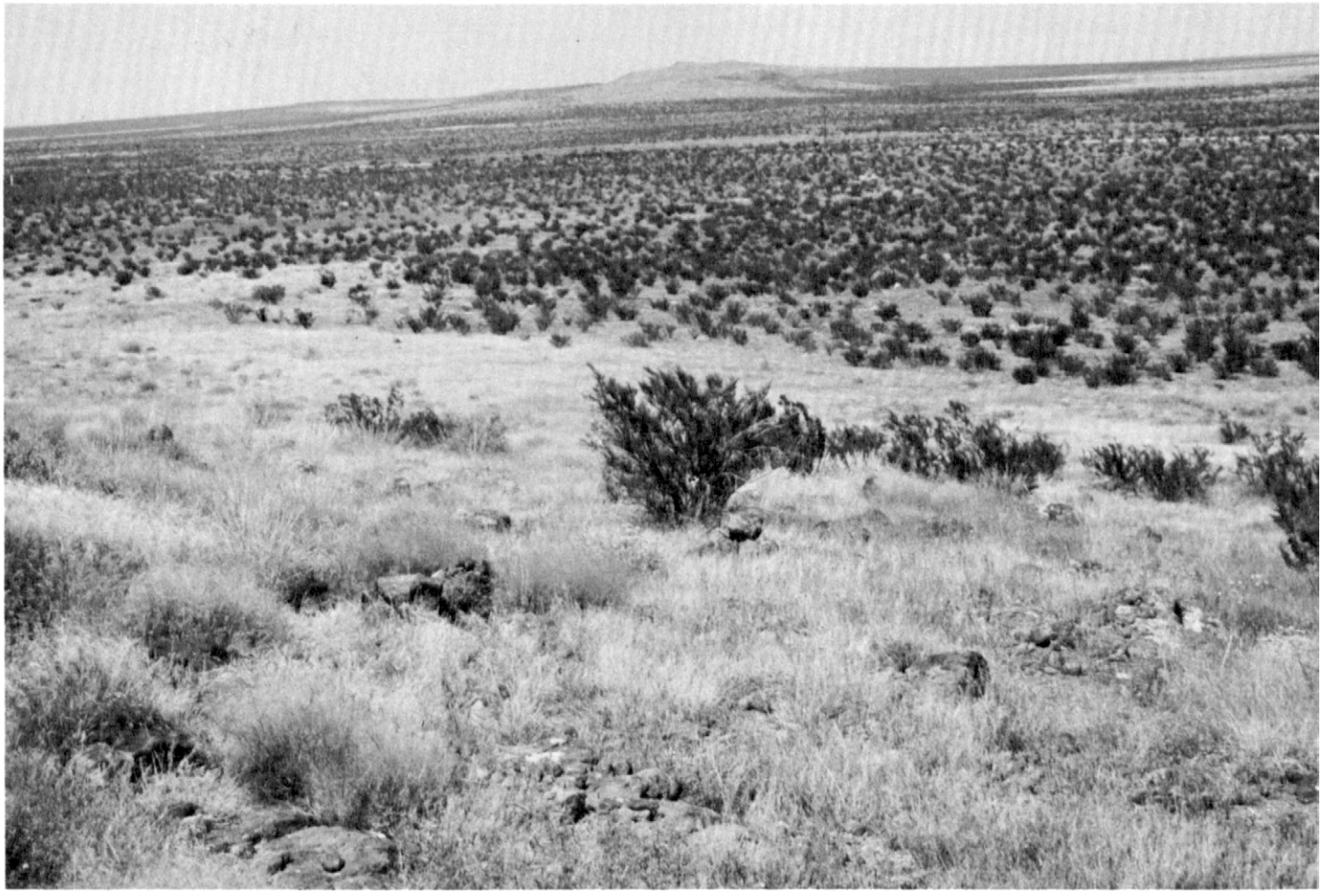
SOIL SURVEY OF

Luna County, New Mexico



United States Department of Agriculture
Soil Conservation Service
In cooperation with
New Mexico Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1956–66. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1967. This survey was made cooperatively by the Soil Conservation Service and the New Mexico Agricultural Experiment Station. It is part of the technical assistance furnished chiefly to the Deming Natural Resource Conservation District and also to the Grant and Caballo Natural Resource Conservation Districts.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, ranching, industry, and recreation.

Locating Soils

All the soils of Luna County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the descriptions of the capability units and the range sites.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Ranchers and others can find, under "Range," grouping of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and for recreation areas in the section "Engineering."

Engineers and builders can find, under "Engineering," information on soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Luna County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the Area."

Cover: **Typical landscape on Shallow range site. Lehmans very rocky loam, 0 to 10 percent slopes, in foreground; Tres Hermanos gravelly loam, 1 to 5 percent slopes, invaded by creosotebush in background.**

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SOIL SURVEY OF LUNA COUNTY, NEW MEXICO

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SOILS SURVEYED BY WILLIAM A. BUCHANAN, HENRY E. BULLOCH, JR., NORMAN M. DAVIS, AND RICHARD L. LINGEL, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE NEW MEXICO AGRICULTURAL EXPERIMENT STATION

LUNA COUNTY is in the southwestern part of New Mexico (fig. 1). It is bordered on the south by the Republic of Mexico, on the east by Dona Ana County, on the north by Grant and Sierra Counties, and on the west by Grant and Hidalgo Counties. The county has an area of 2,957 square miles, or 1,892,480 acres.

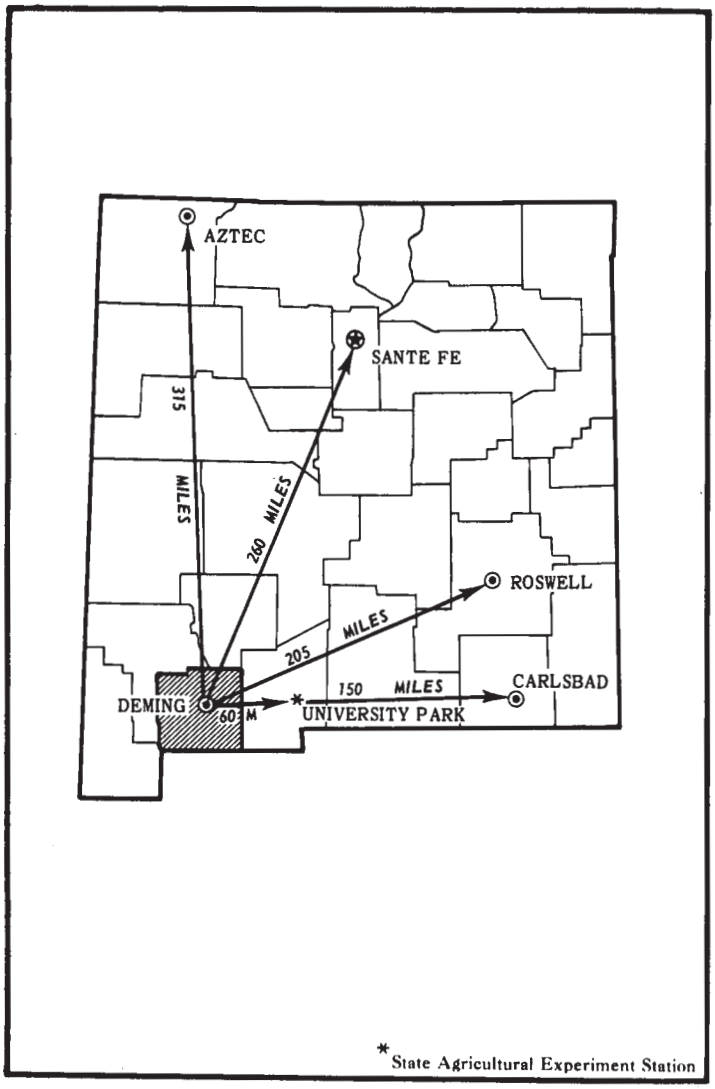

Figure 1.—Location of Luna County in New Mexico.

Deming, the county seat, is on U.S. Highways 70, 80, and 180 and Interstate 10. It is served by two railroads, the Santa Fe and the Southern Pacific. Several State highways also serve the area.

The climate of Luna County is semi-arid and is characterized by fairly warm winters and hot summers, light rainfall, and relatively low humidity.

There are two general types of farming, livestock grazing and irrigated farming. Irrigated farming is chiefly in the central part of the county around Deming, the south-central part near Columbus, and the northeastern part in the Uvas Valley. The main crops are cotton, grain sorghum, alfalfa, beans, barley, and vegetables.

Water for irrigation comes from the underground water basin through the use of irrigation pumps. The total irrigated area is about 50,000 acres. The rest of the county is range. The livestock is mainly cattle, dominantly cow-calf enterprises. Some horses are also raised.

Most of Luna County is in the Deming Natural Resource Conservation District.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Luna County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the pro-

files they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Gila and Mimbres, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Mohave sandy clay loam, 0 to 1 percent slopes, is one of the several phases within the Mohave series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the scattered small bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three other kinds of mapping units are shown on the soil map of Luna County: soil complexes, soil associations, and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Mohave-Pintura complex, eroded, is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Hondale-Bluepoint association is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." Mimbres and Verhalen soils is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Riverwash and Rock land are examples in Luna County.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

Mapping Intensity

Part of Luna County was mapped at high intensity and part at low intensity (fig. 2). The major built-up area around Deming and the irrigated valleys were surveyed at high intensity. The soils were examined at closer intervals and mapped in more detail than those mapped at low intensity. Also, fewer areas of other soils were included in each mapping unit. Most mapping units were individual soils, not associations or complexes.

Range was mapped at low intensity. The soils were

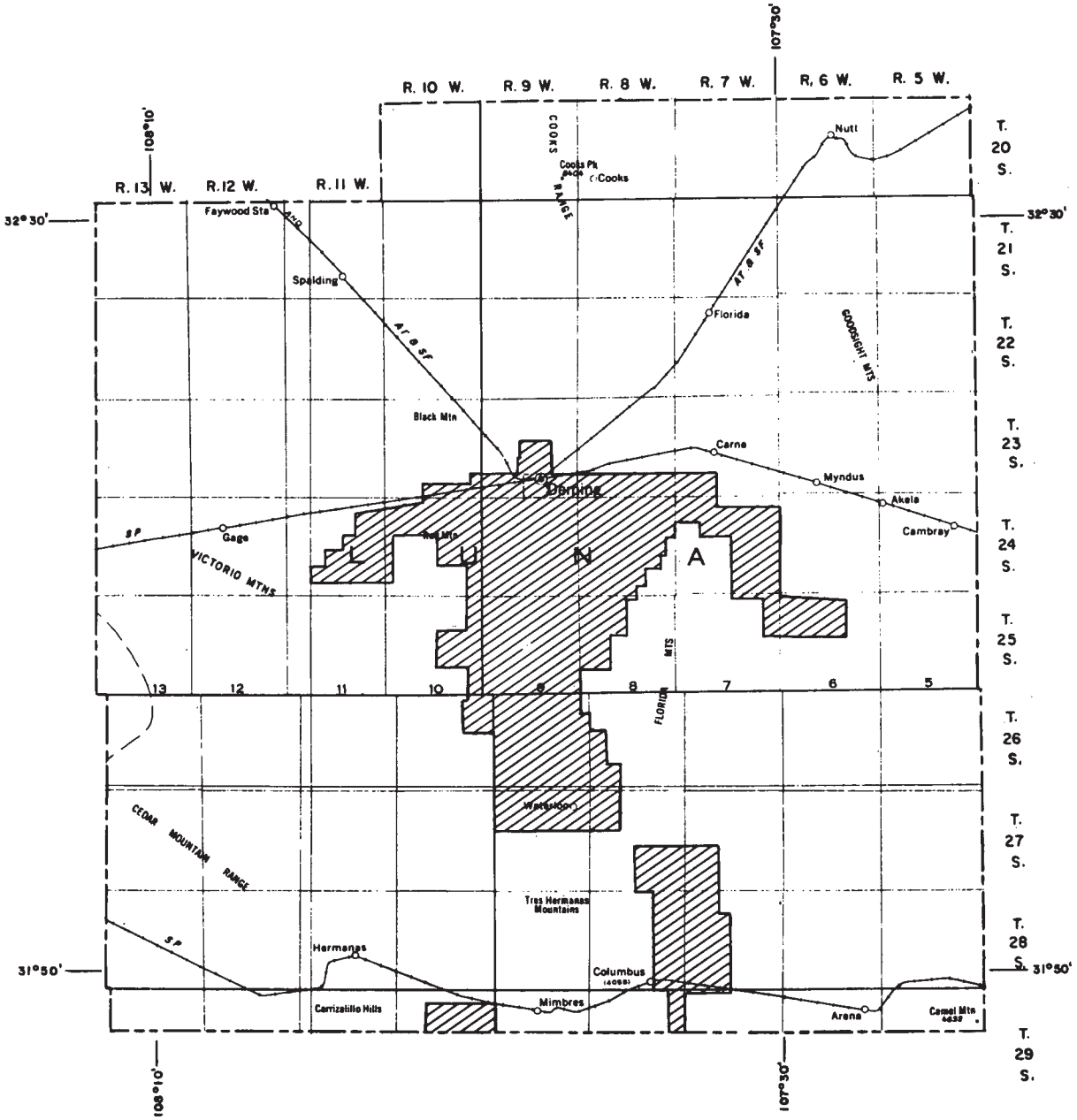

***Figure 2.*—Soil survey intensity map. Hachures identify the area mapped at high intensity. The rest of the area was mapped at low intensity.**

examined at moderate to wide intervals. In several places, two or more soils were mapped together as a complex or an association. Each of these multiple mapping units was named for the major soils, and the dominant soil was named first, for example, Bluepoint-Onite association. If the acreage of an individual soil was large enough, the soil was mapped separately. A wide range of slope was permitted within a unit unless there were major differences in use and management.

The symbol shows at which intensity the soil is mapped. The first letter is always a capital. The second letter is lower case if the soil was mapped at high intensity and upper case if at low intensity. The scale of the soil maps at the back of this survey is the same for both intensities. The only reference to survey intensity in the soil descriptions is in the mapping units mapped at both high and low intensity.

The "Guide to Mapping Units" at the back of this publication is arranged by high intensity survey and low intensity survey. As an example, Mohave sandy clay loam, 0 to 3 percent slopes, is in the low intensity survey. Mohave sandy clay loam, 0 to 1 percent slopes, is in the high intensity survey. Sonoita gravelly sandy loam is in both high and low intensity surveys. The mapping unit symbol designates the intensity of the survey.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Luna County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or ranch, or for selecting the exact location of a road, building, or other structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The nine soil associations in this survey are described on the following pages. The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 3, the words, "moderately fine textured" refer to the texture of the surface layer.

1. *Lehmans-Rough broken and rock land association*

Shallow and very shallow, medium-textured, rolling to very steep cobbly soils and rock outcrop on hills and mountains

This association consists of land types and well-drained soils that are very shallow and shallow over bedrock. Bedrock is chiefly acid igneous rock and some limestone and basalt. Rock outcrops are numerous. Slopes are 0 to 75 percent. The vegetation is mid and short grasses, creosotebush, yucca, and, at the higher elevations, some oak brush, pinyon, and juniper. Elevation ranges from 4,000 to 8,400 feet. The mean annual precipitation is about 8 to 14 inches, the mean annual air temperature is 50° to 62° F, and the frost-free season is 150 to 210 days.

This association makes up about 20 percent of Luna County. It is about 35 percent Lehmans soils; 35 percent Rough broken and rock land; 25 percent gravelly or stony Ledru, Luxor, Graham, Lozier, and Brenda soils; and 5 percent nonstony Nickel, Upton, and Mimbres soils.

Lehmans soils are on hills. They have slopes of 10 to 25 percent. They have a surface layer of yellowish-brown cobbly loam and a subsoil of dark yellowish-brown and yellowish-brown cobbly clay and cobbly sandy clay loam. They are shallow over acid igneous bedrock.

Rough broken and rock land occupies the steeper hills and mountains. Slopes are mainly 25 to 75 percent. Rock outcrops are numerous, and the soils are shallow and very shallow and have boulders or stones on the surface.

The chief value of this association is esthetic. It is also used for livestock grazing, wildlife, and watershed.

2. *Nickel-Upton-Tres Hermanos association*

Shallow and deep, moderately coarse and medium textured, nearly level to rolling very gravelly and gravelly limy soils on piedmont slopes

This association consists of well-drained soils that are very shallow to shallow over indurated caliche or are deep and contain layers of lime accumulation. The soils are mainly around the bases of the major hills and mountains in the county. They formed on piedmont slopes in old valley-fill sediments derived from mixed sources, mainly limestone and rhyolite. Slopes are 1 to 10 percent. The vegetation is mid and short grasses, creosotebush, American tarbush, and annuals. Elevation ranges from 4,000 to 5,500 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is about 57° to 62° F, and the frost-free season is 170 to 210 days.

This association makes up about 11 percent of the county. It is about 40 percent Nickel soils, 35 percent Upton soils, 15 percent Tres Hermanos soils, and 10 percent Mimbres and Verhalen soils.

Nickel soils have a surface layer of dark yellowish-brown very gravelly sandy loam. The substratum is yellowish-brown very gravelly loam over brown to light-brown gravelly loam to cobbly loam. Weakly cemented caliche is at a depth of 10 to 16 inches.

Upton soils have a surface layer of pale-brown gravelly sandy loam. The substratum is very pale brown gravelly loam and is high in content of lime. Indurated caliche and gravel are within 4 to 20 inches of the surface.

Tres Hermanos soils have a surface layer of pinkish-gray gravelly loam. The subsoil is brown heavy gravelly loam and gravelly clay loam. The substratum is light-brown gravelly clay loam that has lime-coated gravel in the upper part and very gravelly sandy clay loam, stones, and cobbles at a depth of 36 inches.

This association is used for livestock grazing, wildlife, and watershed.

3. *Mohave-Stellar association*

Deep, moderately fine textured, nearly level to gently undulating soils on alluvial fans

This association consists of well-drained soils in the major intermountain valleys, mainly on old alluvial fans. The soils formed in old alluvial valley-fill sediments from mixed sources. In places the material has been reworked by wind. Slopes are mainly 0 to 3 percent. The vegetation is short and mid grasses, Mormontea, yucca, and mesquite. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is about 57° to 62° F, and the frost-free season is 180 to 210 days.

This association makes up about 32 percent of the county. It is about 40 percent Mohave soils, 30 percent Stellar soils, and 30 percent Berino, Bluepoint, Onite, Arizo, Vinton, Sonoita, Dona Ana, Upton, Nickel, and Mimbres soils.

Mohave soils have a surface layer of brown sandy clay loam. The subsoil is reddish-brown and yellowish-

red sandy clay loam and clay loam. The substratum is light-brown clay loam. The upper part is high in content of lime.

Stellar soils have a surface layer of pale-brown silty clay loam. The subsoil is reddish-brown silty clay and clay. The substratum is reddish-brown and light reddish-brown clay loam.

This association is used for irrigated crops, livestock grazing, wildlife, and watershed.

4. *Bluepoint-Onite association*

Deep, coarse-textured, nearly level to undulating soils on alluvial fans

This association consists of somewhat excessively drained and well-drained soils. The soils formed in old sandy alluvium of valley-fill sediments derived from mixed sources. Slopes are 0 to 5 percent. The vegetation is short and mid grasses, mesquite, and yucca. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is about 57° to 62° F, and the frost-free season is 180 to 210 days.

This association makes up about 2 percent of the county. It is about 50 percent Bluepoint soils, 35 percent Onite soils, and 15 percent Mohave, Mimbres, and Verhalen soils.

Bluepoint soils have a surface layer of brown loamy sand. The substratum is brown, grayish-brown, and light brownish-gray loamy fine sand and fine sand.

Onite soils have a surface layer of brown loamy sand. The subsoil is reddish-brown sandy loam. The substratum is strong-brown loamy sand and gravelly sand.

This association is used for livestock grazing and wildlife.

5. *Pintura-Berino-Simona association*

Shallow to deep, coarse-textured, nearly level to undulating, hummocky soils on alluvial fans

This association consists of well-drained and somewhat excessively drained soils. The soils formed in old alluvium that has been reworked by wind and is hummocky. The alluvial, valley-fill sediments are derived from mixed parent rocks. Slopes are 0 to 5 percent. The vegetation is short and mid grasses, mesquite, and yucca. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is about 58° to 62° F, and the frost-free season is 180 to 210 days.

This association makes up about 8 percent of the county. It is about 35 percent Pintura soils, 25 percent Berino soils, 25 percent Simona soils, and 15 percent Mohave, Bluepoint, and Akela soils.

Pintura soils have a surface layer and substratum of brown fine sand.

Berino soils have a surface layer of reddish-brown loamy sand. The subsoil is reddish-brown and light reddish-brown sandy clay loam and heavy sandy loam. The substratum is reddish-brown loamy sand.

Simona soils have a surface layer of brown loamy sand. The subsoil is brown light sandy loam. White indurated caliche is at a depth of 18 inches.

This association is used for livestock grazing and wildlife.

6. *Hondale-Mimbres-Bluepoint association*

Deep, moderately fine to coarse textured, nearly level to gently sloping soils on alkali flats

This association consists of well-drained and somewhat excessively drained soils on basin floors. The narrow ridges 1 foot to 3 feet high are Bluepoint soils. The soils formed in old alluvium weathered from mixed parent rocks. All but Bluepoint soils are alkali affected. Slopes are 0 to 3 percent. The vegetation is short and mid grasses, four-wing saltbush, and mesquite. Many slickspots are devoid of vegetation. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is about 57° to 62° F, and the frost-free season is 170 to 210 days.

This association makes up about 15 percent of the county. It is about 70 percent Hondale soils, 10 percent Mimbres soils, 10 percent Bluepoint soils, and 10 percent Verhalen, Pintura, Berino, Mohave, and Simona soils.

Hondale soils have a surface layer of light reddish-brown loam. The subsoil is reddish-brown and light reddish-brown clay, clay loam, and sandy clay loam subsoil. The substratum is pinkish-white heavy loam. Hondale soils contain excessive amounts of exchangeable sodium.

Mimbres soils have a surface layer of light brownish-gray silty clay loam. The subsoil is pale-brown silty clay loam. The substratum is very pale brown silty clay loam and pale-brown sandy clay loam and contains some lime accumulation in the upper part. Mimbres soils also contain excessive amounts of exchangeable sodium.

Bluepoint soils have a surface layer of brown loamy sand. The substratum is brown, grayish-brown, and light brownish-gray loamy fine sand and fine sand.

This association is used for irrigated crops, livestock grazing, wildlife, and watershed.

7. *Mimbres association*

Deep, moderately fine textured, level to gently undulating soils on basin floors and alluvial fans

This association consists of well-drained soils, some of which are subject to occasional flooding and overflow. It is on broad, smooth intermountain basins. Mimbres soils are on bottom land. They formed in mixed alluvium of varying texture. Slopes are 0 to 3 percent. The vegetation is short and mid grasses, mesquite, and four-wing saltbush. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 170 to 210 days.

This association makes up about 6 percent of the county. It is about 65 percent Mimbres soils, 20 percent Harkey, Jal, Maricopa, and Karro soils, and 15 percent Mohave, Gila, and Dona Ana soils.

Mimbres soils have a surface layer of light brownish-gray silty clay loam. The subsoil is pale-brown silty clay loam. The substratum is very pale brown silty clay loam and pale-brown sandy clay loam that contains some lime accumulation in the upper part.

This association is used for irrigated crops, livestock grazing, wildlife, and watershed.

8. *Eba association*

Deep, moderately fine textured, nearly level to rolling very gravelly soils on piedmont slopes

This association consists of well-drained soils, mainly around the base of the Florida Mountains. The soils formed in old alluvial piedmont sediments derived from acid igneous rocks. Slopes range from 1 to 10 percent. The vegetation is mid and short grasses, creosotebush, and four-wing saltbush. Elevation ranges from 4,000 to 5,500 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 60° F, and the frost-free season is 170 to 210 days.

This association makes up about 3 percent of the county. It is about 80 percent Eba soils, 15 percent Sonoita soils, and 5 percent Nickel, Lehmans, and Mohave soils.

Eba soils have a surface layer of brown very gravelly clay loam. The subsoil is reddish-brown gravelly clay loam and red and pink very gravelly clay. The substratum is light reddish-brown very gravelly clay that is high in content of lime in the upper part and in many places is weakly cemented.

This association is used for livestock grazing, wildlife, and watershed.

9. *Mimbres-Verhalen association*

Deep, moderately fine textured, nearly level soils on alluvial flood plains and bottoms

This association consists of well-drained and moderately well drained soils that are subject to occasional flooding and overflow. It is in concave swales and on bottom lands. The soils formed in mixed alluvium. Slopes are 0 to 1 percent. The vegetation is mainly short and mid grasses and mesquite. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 170 to 210 days.

This association makes up about 3 percent of the county. It is about 50 percent Mimbres soils, 40 percent Verhalen soils, and 10 percent Hondale, Mohave, and Stellar soils and undifferentiated alluvial soils.

Mimbres soils have a surface layer of light brownish-gray silty clay loam. The subsoil is pale-brown silty clay loam. The substratum is very pale brown silty clay loam and pale-brown sandy clay loam and contains some lime accumulation in the upper part.

Verhalen soils have a surface layer of brown silty clay loam. The substratum is reddish-brown and pinkish-gray clay and silty clay.

This association is used for irrigated crops, livestock grazing, wildlife, and watershed.

Descriptions of the Soils

This section describes the soil series and mapping units of Luna County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color and consistence terms are for dry soil unless otherwise stated. The profile described is representative of the mapping units in that series. If the profile of a given mapping unit differs from the one described, these differences are stated in describing the mapping unit, or they are apparent in the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Rock land, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Some soils are mapped at both high and low intensities. Any differences observed at either intensity are mentioned in the soil description.

A symbol precedes the name of each mapping unit. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and range site to which the mapping unit has been assigned. The page for the description of each capability unit or other interpretative group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*6*).[1]

Akela Series

The Akela series consists of shallow, well-drained soils. These soils formed in windblown sand underlain by basalt. Slopes are 0 to 25 percent. The vegetation is creosotebush, American tarbush, black grama, tobosa, mesa dropseed, annual grasses, and annual weeds. Elevation ranges from 4,500 to 5,500 feet. The mean annual precipitation is 8 to 10 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 170 to 210 days.

In a representative profile the surface layer is pale-brown very gravelly loam about 3 inches thick. The substratum is pale-brown very gravelly loam 15 inches thick. It has lime coatings on the gravel and cobblestones. Lime-coated basalt is at a depth of about 18 inches.

Akela soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Akela very gravelly loam,

[1] Italic numbers in parentheses refer to Literature Cited, p. 78.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Intensity		Percent of county
	High	Low	
	Acres	*Acres*	
Akela very gravelly loam, 0 to 10 percent slopes		12,721	0.7
Akela very gravelly loam, 10 to 25 percent slopes		6,981	.4
Arizo and Vinton soils		10,094	.5
Berino and Mohave soils		65,096	3.4
Bluepoint loamy sand, 0 to 3 percent slopes	8,233		.4
Bluepoint loamy sand, 0 to 3 percent slopes, hummocky	3,549		.2
Bluepoint loamy sand, 3 to 10 percent slopes		1,751	.1
Bluepoint-Onite association		85,690	4.5
Brenda gravelly clay loam, 10 to 25 percent slopes		2,735	.1
Cottonwood and Reeves sandy loams		867	(1)
Dona Ana sandy loam	5,289		.3
Dona Ana sandy clay loam	5,947		.3
Dona Ana-Pintura complex, eroded	2,188		.1
Dune land-Pintura complex		19,882	1.1
Eba very gravelly clay loam, 0 to 10 percent slopes	2,129	39,088	2.2
Gila sandy loam	6,774		.4
Gila sandy loam, hummocky	3,081		.2
Gila loam	5,714		.3
Graham rocky clay loam, 10 to 25 percent slopes		6,435	.3
Harkey sandy loam	1,160		.1
Harkey loam, hummocky	1,450		.1
Harkey silt loam	6,282		.3
Hondale loam	34,124		1.8
Hondale soils, strongly alkali	13,503		.7
Hondale soils, eroded	6,024		.3
Hondale-Mimbres complex		154,109	8.1
Hondale-Bluepoint association		54,302	2.9
Jal fine sandy loam	6,908		.4
Karro silty clay loam	3,816		.2
Ledru gravelly clay loam, 10 to 25 percent slopes		8,130	.4
Lehmans very rocky loam, 0 to 10 percent slopes		64,477	3.4
Lehmans extremely rocky loam, 10 to 25 percent slopes		78,314	4.1
Lozier extremely rocky loam, 0 to 10 percent slopes		5,556	.3
Luxor extremely stony loam		7,564	.4
Maricopa sandy loam	12,128		.6
Maricopa sandy loam, hummocky	1,570		.1
Mimbres loam	6,638		.4
Mimbres silty clay loam	29,258		1.6
Mimbres silty clay loam, alkali	4,629		.2
Mimbres silty clay loam, sandy subsoil variant	2,927		.2
Mimbres soils		14,028	.7
Mimbres soils, eroded	793		(1)
Mimbres and Verhalen soils		116,944	6.2
Mohave sandy loam, 0 to 1 percent slopes	2,402		.1
Mohave sandy clay loam, 0 to1 percent slopes	7,533		.4
Mohave sandy clay loam, 0 to 3 percent slopes		161,283	8.5
Mohave-Pintura complex, eroded	8,756		.5
Nickel very gravelly sandy loam, 3 to 9 percent slopes		68,243	3.6
Nickel-Tres Hermanos complex		42,052	2.2
Pintura-Berino complex, eroded		85,319	4.5
Pintura-Simona complex, eroded		23,415	1.2
Riverwash		362	(1)
Rock land		3,840	.2
Rough broken and rock land		102,152	5.4
Simona loamy sand, 0 to 5 percent slopes		33,825	1.8
Sonoita gravelly sandy loam	3,832	25,497	1.6
Sonita-Pintura complex, eroded	4,037		.2
Stellar sandy loam		19,300	1.0
Stellar silty clay loam		144,902	7.7
Stellar silty clay loam, 0 to 1 percent slopes	5,671		.3
Stony land		29,379	1.6
Tres Hermanos gravelly loam, 1 to 5 percent slopes		30,373	1.6
Turney-Dona Ana association		33,150	1.8
Upton gravelly sandy loam, 3 to 10 percent slopes		96,576	5.1
Upton gravelly loam, 0 to 10 percent slopes		18,749	1.0
Verhalen silty clay loam	2,862		.2
Verhalen silty clay loam, alkali	7,246		.4
Yturbide loamy sand	2,408		.1
Mine dump		155	(1)
Gravel pits		283	(1)
Subtotal	218,861	1,673,619	
Total	1,892,480		100.0

[1] Less than 0.05 percent.

0 to 10 percent slopes, 50 yards south of State Highway 9, SW¼SW¼ sec. 2, T. 29 S., R. 10 W.

A1—0 to 3 inches, pale-brown (10YR 6/3) very gravelly loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable moist, slightly sticky and slightly plastic wet; common fine and very fine roots and few medium roots; few fine and very fine interstitial pores and very few fine tubular pores; 60 percent gravel and cobblestones; moderately calcareous; mildly alkaline; clear, smooth boundary.

Cca—3 to 18 inches, pale-brown (10YR 6/3) very gravelly loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable moist, slightly sticky wet; common fine and very fine roots; few fine interstitial pores and common fine tubular pores; strongly calcareous, lime is disseminated and segregated as coatings on basalt gravel and cobblestones; moderately alkaline; clear, smooth boundary.

R—18 inches, basalt; lime coated on the surface.

The A horizon and C horizon have hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 6. The Cca horizon ranges from very gravelly loam to very gravelly fine sandy loam. Depth to the lime-coated basalt ranges from 10 to 20 inches.

AG—Akela very gravelly loam, 0 to 10 percent slopes. This nearly level to rolling soil is mainly in the southern part of the county. A few scattered areas are in the high intensity part of the county. The soil has the profile described as representative of the series.

Included in mapping are areas of Rough broken and rock land and small areas of Mohave and Stellar soils.

Permeability is moderate, and the available water capacity is very low. Runoff is medium. The hazard of water erosion is slight. Roots penetrate to a depth of 10 inches to 20 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Malpais range site.

AK—Akela very gravelly loam, 10 to 25 percent slopes. This rolling to hilly soil is on basalt hills in the south-central and eastern parts of the county. Included in mapping are areas of rock outcrops and small areas of Akela very gravelly loam, 0 to 10 percent slopes, and Graham soils.

Permeability is moderate, and the available water capacity is very low. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 10 to 20 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Breaks range site.

Arizo Series

The Arizo series consists of deep, excessively drained soils along the Mimbres River. These soils formed in recent gravelly alluvial sediments. Slopes are 0 to 5 percent. The vegetation is black grama, bush muhly, mesa dropseed, and annual weeds. Elevation ranges from 4,000 to 5,500 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is grayish-brown sandy loam about 4 inches thick. The substratum is stratified light brownish-gray and pale-brown very gravelly sand and loamy sand to a depth of 60 inches or more. The soil is slightly calcareous throughout.

Arizo soils are used for livestock grazing and wildlife. They are rarely subject to flooding.

Representative profile of Arizo sandy loam in an area of Arizo and Vinton soils, in Deming, 600 feet south of northwest corner of sec. 7, T. 23 S., R. 10 W.

A1—0 to 4 inches, grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak, thin, platy structure; soft, very friable moist; many fine and few medium roots; few fine tubular pores; slightly calcareous; mildly alkaline; abrupt, wavy boundary.

IIC1—4 to 10 inches, light brownish-gray (10YR 6/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grained; loose dry and moist; few fine and very fine roots; many fine interstitial pores; slightly calcareous; mildly alkaline; clear, smooth boundary.

IIIC2—10 to 20 inches, pale-brown (10YR 6/3) loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose dry and moist; few fine and very fine roots; common fine interstitial pores; slightly calcareous; mildly alkaline; abrupt smooth boundary.

IVC3—20 to 60 inches, very gravelly sand, 70 percent rounded gravel; single grained; loose dry and moist; slightly calcareous; mildly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 to 6 moist, and chroma of 2 to 4. It is sandy loam or loamy sand. The C horizon has hue of 7.5YR or 10YR and value of 4 to 6 dry and 3 to 5 moist. The IIIC horizon is fine sand or loamy sand stratified with thin lenses of silt, clay, and gravel.

AV—Arizo and Vinton soils. This nearly level to undulating mapping unit is along the Mimbres River. Slopes are 0 to 5 percent. Some areas are entirely Arizo soil, some are Vinton soil, and some are both soils. About 45 percent of the total acreage of this unit is Arizo sandy loam, and about 40 percent is Vinton loamy sand. About 15 percent is included areas of Harkey and Mimbres soils and areas of Riverwash along the stream channel. Cottonwood and desert willow grow in these included areas.

Permeability is very rapid in the Arizo soil and moderately rapid in the Vinton soil. The available water capacity is low. Runoff is slow. The hazard of water erosion is slight on the Arizo soil. The hazard of soil blowing is severe on the Vinton soil. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing and wildlife. Capability subclass VIIe dryland; Arizo soil in Gravelly range site; Vinton soil in Deep Sand range site.

Berino Series

The Berino series consists of deep, well-drained soils. These soils formed in mixed old alluvial sediments reworked by wind. Slopes are 0 to 3 percent. The vegetation is yucca, mesquite, mesa dropseed, and annual weeds. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is reddish-brown loamy sand about 5 inches thick. The subsoil is reddish-brown and light reddish-brown heavy sandy loam and light sandy clay loam about 35 inches thick. It is high in content of lime in the lower part. The substratum is strongly calcareous reddish-brown loamy sand to a depth of 60 inches or more.

Berino soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Berino loamy sand in an area of Berino and Mohave soils, 2,640 feet west and 1,760 feet south of northeast corner of sec. 30, T. 26 S., R. 5 W., north side of road near curve in road:

A1—0 to 5 inches, reddish-brown (5YR 5/4) loamy sand, dark reddish brown (5YR 3/4) moist; single grained; loose dry and moist; few medium roots; common fine interstitial pores; mildly alkaline; clear, smooth boundary.

B1—5 to 15 inches, reddish-brown (5YR 5/4) heavy sandy loam, dark reddish brown (5YR 3/4) moist; weak, coarse, prismatic structure; slightly hard, very friable moist; few fine and very fine roots; many fine interstitial pores; mildly alkaline; clear, smooth boundary.

B2t—15 to 32 inches, reddish-brown (5YR 5/4) light sandy clay loam, reddish brown (5YR 4/4) moist; weak, coarse, subangular blocky structure; slightly hard, very friable moist, slightly sticky wet; few fine and very fine roots; common fine interstitial pores; few thin patchy clay films on ped faces and in pores; slightly calcareous; moderately alkaline; clear, wavy boundary.

B3tca—32 to 40 inches, light reddish-brown (5YR 6/3) light sandy clay loam, reddish brown (5YR 5/3) moist; weak, coarse, subangular blocky structure;

slightly hard, very friable moist, slightly sticky and slightly plastic wet; few fine roots; few fine tubular pores; thin patchy clay films on ped faces and in pores; strongly calcareous, disseminated and segregated lime as common, distinct, soft lime masses; moderately alkaline; clear, smooth boundary.

Cca—40 to 60 inches, reddish-brown (5YR 5/4) loamy sand, reddish brown (5YR 4/4) moist; single grained; loose dry and moist; many fine interstitial pores; strongly calcareous, streaks of segregated lime which decrease with depth; moderately alkaline.

The A horizon has hue of 5YR to 10YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 4 to 6. It is loamy sand or sandy loam. The B horizon has hue of 2.5YR through 5YR. The B2t horizon is light sandy clay loam or light clay loam. Depth to the B3tca horizon ranges from 30 to 40 inches. Gravel content is 0 to 5 percent.

BA—Berino and Mohave soils. This nearly level to gently undulating mapping unit is on valley-fill material that has been reworked by wind. A few hummocks have formed around shrubs. Slopes are 0 to 3 percent. Some areas are entirely Berino soil, and some Vinton soil. About 65 percent of the total acreage of this unit is Berino soil and 30 percent is Mohave soil. About 5 percent is included areas of Pintura and Simona soils. The Mohave soil has a profile similar to the one described as representative of the Mohave series, but the surface layer is sandy loam.

Permeability is moderate in the Berino soil and moderately slow in the Mohave soil. The available water capacity is moderate in the Berino soil and high in the Mohave soil. Runoff is slow. The hazard of soil blowing is moderate to severe. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Sandy range site.

Bluepoint Series

The Bluepoint series consists of deep, somewhat excessively drained soils that formed in mixed material deposited on flood plains and alluvial fans by streams and washes. Slopes are 0 to 10 percent. The vegetation is mesquite, yucca, mesa dropseed, fluffgrass, and annual weeds. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is brown loamy sand about 6 inches thick. The substratum is brown, grayish-brown, and light brownish-gray loamy fine sand and fine sand. The soil is noncalcareous to slightly calcareous.

Bluepoint soils are used mainly for livestock grazing, wildlife, and watershed. Small areas are used for irrigated crops.

Representative profile of Bluepoint loamy sand, 0 to 3 percent slopes, 700 feet south and 50 feet east of northwest corner of sec. 9, T. 24, S., R. 9 W.

A1—0 to 6 inches, brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; weak, medium, platy structure; soft, very friable moist; few fine and medium roots; common fine interstitial pores; mildly alkaline; abrupt, smooth boundary.

C1—6 to 20 inches, brown (10YR 5/3) loamy fine sand, dark brown (7.5YR 4/4) moist; weak, coarse, subangular blocky structure; slightly hard, very friable moist; few fine and very fine roots; common fine and very fine interstitial pores; mildly alkaline; clear, smooth boundary.

C2—20 to 45 inches, grayish-brown (10YR 5/2) loamy fine sand, dark brown (10YR 4/3) moist; single grained; loose dry and moist; very few fine and very fine roots; slightly calcareous, mildly alkaline; abrupt, smooth boundary.

C3—45 to 60 inches, light brownish-gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose dry and moist; mildly alkaline.

All horizons have hue of 7.5YR or 10YR and value of 4 or 5 moist. The A horizon is sandy loam, loamy sand, or fine sand.

Bd—Bluepoint loamy sand, 0 to 3 percent slopes. This level to gently undulating soil occurs as slight ridges 1 foot to 3 feet high on old flood plains and alluvial fans. Slopes are short. The soil has the profile described as representative of the series. Included in mapping are small areas of Mimbres and Hondale soils.

Permeability is rapid, and the available water capacity is low. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches or more.

This soil is used for irrigated crops, livestock grazing, and wildlife. Capability unit IIIe–11 irrigated; capability subclass VIIe dryland; Deep Sand range site.

Be—Bluepoint loamy sand, 0 to 3 percent slopes, hummocky. This soil is level to gently undulating. Sand hummocks 2 to 8 feet high are on the surface. Included in mapping are small areas of Mimbres soils and Bluepoint loamy sand, 0 to 3 percent slopes.

Permeability is rapid, and the available water capacity is low. Runoff is slow. The hazard of soil blowing is severe and active. Roots penetrate to a depth of 60 inches or more.

This soil is used for livestock grazing and wildlife. It is suitable for irrigation if the dunes are leveled. Capability unit IIIe–11 irrigated; capability subclass VIIe dryland; Sand Hills range site.

BG—Bluepoint loamy sand, 3 to 10 percent slopes. This undulating to rolling soil is on foot slopes around the base of mountains. Included in mapping are small areas of Nickel and Mohave soils.

Permeability is rapid, and the available water capacity is low. Runoff is normally slow, but is rapid during intensive rainstorms. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches or more.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Deep Sand range site.

BO—Bluepoint-Onite association. This nearly level to undulating mapping unit is along the lower slopes of mountains and foothills. Slopes are 0 to 5 percent. The mapping unit is about 50 percent Bluepoint loamy sand and 35 percent Onite loamy sand. About 15 percent is included areas of Mohave and Mimbres soils. The Bluepoint soil is on undulating ridges, and the Onite soil is in less sloping to slightly depressed areas. The profile of the Onite soil is the one described as typical of the series.

Permeability is rapid in the Bluepoint soil and moderately rapid in the Onite soil. The available water

capacity is low. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches or more.

This mapping unit is used for livestock grazing and wildlife. Capability subclass VIIe dryland; Deep Sand range site.

Brenda Series

The Brenda series consists of deep, well-drained soils. These soils formed in alluvial sediments, mainly from the Sante Fe conglomerate formation. Slopes are 10 to 25 percent. The vegetation is tobosa, black grama, blue grama, and bush muhly. Elevation ranges from 4,500 to 5,500 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is grayish-brown gravelly clay loam about 2 inches thick. The subsoil is dark grayish-brown and yellowish-brown gravelly clay loam about 22 inches thick. The substratum is light-gray gravelly coarse sand to a depth of 60 inches and more. The soil is calcareous throughout.

Brenda soils are used mainly for livestock grazing, wildlife, and watershed.

Representative profile of Brenda gravelly clay loam, 10 to 25 percent slopes, 600 feet south and 80 feet east of northwest corner of SE¼ sec. 21, T. 20 S., R. 8 W.

A1—0 to 2 inches, grayish-brown (10YR 5/2) gravelly clay loam, dark brown (10YR 3/3) moist; weak, thin, platy structure parting to weak, fine, granular; soft, very friable moist; many fine and few medium roots; common fine vesicular pores; strongly calcareous; mildly alkaline; clear, smooth boundary.

B21t—2 to 14 inches, dark grayish-brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate, medium, subangular blocky structure; slightly hard, very friable moist, slightly sticky and slightly plastic wet; many fine and very fine roots; common fine tubular pores; moderately thick, nearly continuous clay films on ped surfaces and in pores; moderately calcareous; mildly alkaline; clear, smooth boundary.

B22t—14 to 24 inches, yellowish-brown (10YR 5/4) gravelly clay loam, dark brown (10YR 4/3) moist; weak, fine, subangular blocky structure; soft, very friable moist, slightly sticky and slightly plastic wet; common fine and very fine roots; common fine and very fine tubular pores; few thin clay films on ped surfaces and in pores; moderately calcareous; mildly alkaline; clear, smooth boundary.

IICca—24 to 60 inches, light-gray (10YR 7/2) gravelly coarse sand, dark grayish brown (10YR 4/2) moist; massive; soft, very friable moist; few fine and very fine roots in upper part; many fine interstitial pores; strongly calcareous, lime is segregated as coatings on underneath of gravel; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 dry and 2 or 3 moist, and chroma of 2 or 3. It is gravelly heavy loam, gravelly sandy clay loam, or gravelly clay loam. The B horizon has hue of 7.5YR or 10YR and value of 2 to 4 moist. It is gravelly clay loam or gravelly loam. The Cca horizon has hue ranging from 7.5YR to 10YR, value of 6 to 8 dry and 4 or 5 moist, and chroma of 2 to 4. It is gravelly coarse sand or gravelly fine sand.

BR—Brenda gravelly clay loam, 10 to 25 percent slopes. This rolling to hilly soil is on low ridges and alluvial fans. Slopes are short. Included in mapping are small areas of Ledru and Mimbres soils.

Permeability is slow, and the available water capacity is moderate. Runoff is rapid. The hazard of water erosion is severe. Roots penetrate to a depth of more than 60 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Clayey range site.

Cottonwood Series

The Cottonwood series consists of very shallow to shallow, well-drained upland soils high in content of gypsum. These soils formed in gypsum beds. Slopes are 0 to 3 percent. The vegetation is alkali sacaton, black grama, annual grasses, four-wing saltbush, fluffgrass, mesa dropseed, yucca, and skunkbush sumac. Elevation ranges from 4,000 to 4,500 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is light-brown sandy loam about 8 inches thick. The substratum is soft, powdery gypsum.

Cottonwood soils are used for livestock grazing and wildlife.

Representative profile of Cottonwood sandy loam in an area of Cottonwood and Reeves sandy loams, center of sec. 7, T. 26 S., R. 10 W.

A1—0 to 8 inches, light-brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; weak, thin, platy structure; soft, very friable moist; many fine and very fine roots; few fine and medium tubular pores; many fine vesicular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

Ccs—8 to 36 inches, very pale brown (10YR 8/3) soft powdery gypsum, (10YR 7/4) moist.

The A horizon has value of 5 or 6 dry and 4 or 5 moist and chroma of 2 to 4. It is loam or sandy loam. The C horizon has value of 6 to 8 dry and 5 to 7 moist and chroma of 3 or 4.

CO—Cottonwood and Reeves sandy loams. This nearly level to gently undulating mapping unit is on uplands, mainly along the larger arroyos. Slopes are 0 to 3 percent. Some areas are entirely Cottonwood soil, some are Reeves soil, and some are both soils. About 55 percent of the total acreage of this unit is Cottonwood soil, and about 40 percent is Reeves soil. About 5 percent is included areas of Mohave, Jal, and Hondale soils.

Permeability is moderate. The available water capacity is very low in the Cottonwood soil and low in the Reeves soil. Runoff is medium. The hazard of soil blowing is moderate to severe. Roots penetrate to a depth of 3 to 12 inches in the Cottonwood soil and to a depth of 20 to 30 inches in the Reeves soil.

This mapping unit is used for livestock grazing and wildlife. Capability subclass VIIs dryland; Gyp Flats range site.

Dona Ana Series

The Dona Ana series consists of deep, well-drained soils. These soils formed in old alluvial sediments derived from mixed sources. Slopes are 0 to 3 percent.

The vegetation is tobosa, mesquite, black grama, and mesa dropseed. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is reddish-brown sandy loam about 6 inches thick. The subsoil is light reddish-brown or reddish-brown sandy clay loam about 17 inches thick. The substratum is pinkish-gray and reddish-brown sandy clay loam and loamy sand high in content of lime. The soil is calcareous throughout.

Dona Ana soils are used mainly for livestock grazing, wildlife, and watershed. Small acreages are used for irrigated crops.

Representative profile of Dona Ana sandy loam, 300 feet north and 150 feet west of southeast corner of sec. 36, T. 24 S., R. 7 W.

A1—0 to 6 inches, reddish-brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; weak, thin, platy structure in upper half inch, weak, fine, subangular blocky structure below; soft, very friable moist; common fine and very fine roots and few medium roots; common fine and very fine interstitial pores and few fine tubular pores; slightly calcareous, lime is disseminated; mildly alkaline; clear, smooth boundary.

B21tca—6 to 15 inches, reddish-brown (5YR 5/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak, medium, subangular blocky structure; slightly hard, very friable moist, slightly sticky and slightly plastic wet; common fine and very fine roots; few fine interstitial and tubular pores; few thin clay films on sand grains and in pores; moderately calcareous, lime is generally disseminated with faint lime mycelia and a few small soft masses; mildly alkaline; clear, smooth boundary.

B22tca—15 to 23 inches, light reddish-brown (5YR 6/3) sandy clay loam, reddish brown (5YR 4/3) moist; moderate fine prismatic structure parting to moderate, fine, subangular blocky; soft, very friable moist, slightly sticky wet; very few fine and very fine roots; few very fine interstitial and tubular pores; thin clay films as bridges between sand grains and in pores; strongly calcareous, lime disseminated and in small nodules and few soft large lime masses; moderately alkaline; clear, smooth boundary.

Cca—23 to 40 inches, pinkish-gray (5YR 6/2) sandy clay loam, reddish brown (5YR 5/3) moist; weak, coarse, prismatic structure; hard, friable moist, slightly sticky wet; very few very fine roots; fine and very fine tubular and interstitial pores; strongly calcareous, lime is mainly segregated as soft lime masses and few hard concretions; moderately alkaline; clear, smooth boundary.

IICca—40 to 60 inches; reddish-brown (5YR 5/3) loamy sand, reddish brown (5YR 4/3) moist; massive; soft, very friable moist; many fine interstitial pores; strongly calcareous, soft masses of segregated lime which decreases as depth increases; moderately alkaline.

The A horizon has hue of 5YR to 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 4 or 5. It ranges from sandy loam to sandy clay loam. The B2t horizon has hue of 5YR or 7.5YR and value of 4 to 6 dry and 3 to 5 moist. It ranges from sandy clay loam to light clay loam. The Cca horizon has hue of 5YR to 10YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 2 to 4. Buried soils of clay loam, sandy loam, or loamy sand may occur below a depth of 30 inches.

Da—Dona Ana sandy loam. This nearly level to gently undulating soil has the profile described as representative of the series. Slopes are 0 to 3 percent. Included in mapping are small areas of Mohave, Hondale, and Karro soils.

Permeability and the available water capacity are moderate. Runoff is medium. The hazards of soil blowing and water erosion are moderate. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IIe–2 irrigated; capability subclass VIIe dryland; Sandy range site.

Dc—Dona Ana sandy clay loam. This nearly level to gently undulating soil is in the eastern and central parts of the county. Slopes are 0 to 3 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is sandy clay loam 5 inches thick. Included in mapping are a few small areas of Karro and Mohave soils.

Permeability and the available water capacity are moderate. Runoff is slow. The hazards of soil blowing and water erosion are moderate. Roots penetrate to a depth of about 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Chlorosis of irrigated crops, especially sorghum, is common. Capability unit IIs–4 irrigated; capability subclass VIIe dryland; Loamy range site.

Dp—Dona Ana-Pintura complex, eroded. This mapping unit is mainly in the eastern part of the county. Slopes are 0 to 3 percent. The mapping unit is about 50 percent Dona Ana soil, 40 percent Pintura soil, and 10 percent included areas of blowouts, wind-shifted active sand dunes, uneroded Dona Ana soils, and Mohave, Berino, and Jal soils. The Dona Ana soil is level to nearly level. It has a profile similar to the one described as representative of the Dona Ana series, but it is severely eroded. The Pintura soil is partly stabilized small dunes or hummocks.

Permeability is moderate in the Dona Ana soil and rapid in the Pintura soil. The available water capacity is moderate in the Dona Ana soil and low in the Pintura soil. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Extensive leveling or smoothing is required before it can be used for irrigated crops. Capability unit IVe–11 irrigated; capability subclass VIIe dryland; Dona Ana soil in Sandy range site; Pintura soil in Sand Hills range site.

Dune Land

Dune land is active, wind-shifted sand dunes, mainly in the eastern and southeastern parts of the county. It is gently rolling to hilly and is excessively drained. It is nearly bare of vegetation. The texture is loamy fine sand or fine sand to a depth of 60 inches or more. Individual dunes range from 3 to 10 feet in height. The loose, brown sand is drifted by wind and is actively moving and shifting. Slopes are mainly 1 to 10 percent, but some very short slopes range up to 30 percent. The vegetation is mesquite, yucca, and dropseed

grasses. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

Dune land is used for wildlife and to a very limited extent for livestock grazing.

DT—Dune land-Pintura complex. This gently undulating to rolling mapping unit is mainly in the eastern part of the county. Slopes are 1 to 10 percent. The mapping unit is about 55 percent Dune land, 30 percent Pintura soil, and 15 percent included areas of Berino, Dona Ana, Simona, and Sonoita soils and blowouts. Dune land is in areas where the sand is actively shifting. Slopes are very short. The Pintura soil is gently undulating to undulating in areas where the surface is stabilized enough that vegetation has become established (fig. 3). The profile of the Pintura soil is similar to the one described as representative of the Pintura series, but the surface layer is loamy sand.

Permeability is rapid in the Pintura soil and very rapid in Dune land. Runoff is slow. The hazard of soil blowing is severe. In stabilized areas roots can penetrate to a depth of 60 inches. The available water capacity is low.

This mapping unit is used mainly for wildlife. Small areas of the Pintura soil are grazed. Capability subclass VIIIe dryland; Sand Hills range site.

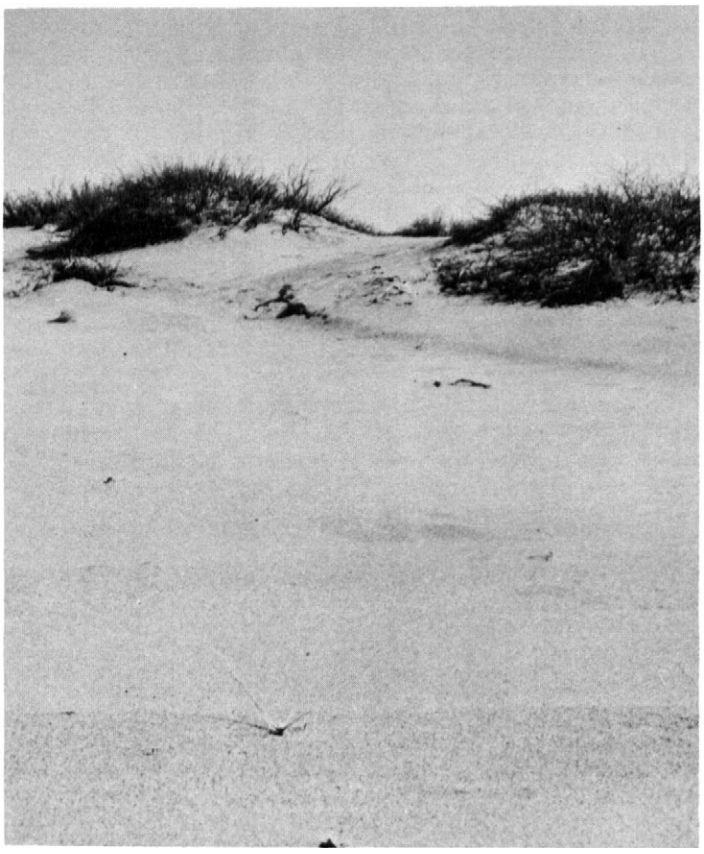

Figure 3.—**Dune land-Pintura complex. Pintura soils are in stable areas; Dune land is actively shifting and barren.**

Eba Series

The Eba series consists of deep, well-drained soils on fans or foot slopes around the base of mountains. These soils formed in mixed igneous alluvial sediments. Slopes are 0 to 10 percent. The vegetation is four-wing saltbush, black grama, blue grama, side-oats grama, tobosa, and annual weeds. Elevation ranges from 4,000 to 5,500 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 60° F, and the frost-free season is 170 to 210 days.

In a representative profile the surface layer is brown very gravelly clay loam about 2 inches thick. The subsoil is reddish-brown gravelly clay loam to pink and red very gravelly clay to a depth of 35 inches. The substratum is light reddish-brown very gravelly clay. The soil is generally leached of lime to a depth of 20 inches, but the lower part of the subsoil is high in content of lime.

Eba soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Eba very gravelly clay loam, 0 to 10 percent slopes, 660 feet west of northeast corner of NW¼ sec. 17, T. 24 S., R. 7 W.

A1—0 to 2 inches, brown (7.5YR 5/4) very gravelly clay loam, reddish brown (5YR 4/3) moist; weak, thin, platy structure; soft, very friable moist; few very fine and fine roots; common very fine interstitial pores and few fine vesicular pores; mildly alkaline; abrupt, smooth boundary.

B1—2 to 5 inches, reddish-brown (5YR 4/4) gravelly clay loam, dark reddish brown (2.5YR 3/4) moist; weak, medium, prismatic structure parting to moderate, fine, subangular blocky; slightly hard, friable moist, slightly sticky wet; many very fine and fine roots; common very fine and fine tubular and interstitial pores; 20 percent coarse fragments, mostly coarse gravel and few cobblestones; mildly alkaline; clear, wavy boundary.

B2t—5 to 31 inches, red (2.5YR 4/6) very gravelly clay; dark red (2.5YR 3/6) moist; moderate, very fine, subangular blocky structure; hard, firm moist, very sticky and plastic wet; common fine roots; common very fine tubular and interstitial pores; many thin clay films on ped faces and in pores; some clay staining on coarse fragments; 50 percent gravel and cobblestones; mildly alkaline; abrupt, wavy boundary.

B3tca—31 to 35 inches, pink (5YR 7/4) very gravelly clay; red (2.5YR 4/6) moist; moderate, fine, subangular blocky structure; hard, firm moist, very sticky and plastic wet; few very fine roots; few very fine tubular pores and many very fine interstitial pores; common thin clay films in pores and on ped faces; some clay staining on coarse fragments; 80 percent gravel and cobblestones; calcareous, lime is disseminated; moderately alkaline; clear, wavy boundary.

C1ca—35 to 60 inches, light reddish-brown (5YR 6/4) very gravelly clay, red (2.5YR 4/6) moist; massive; very hard, firm moist, very sticky and plastic wet; few very fine roots; few very fine tubular and few fine interstitial pores; 70 percent coarse gravel and cobblestones and very few small stones; patchy lime segregations on bottoms of coarse fragments; calcareous, lime is disseminated; moderately alkaline.

The A horizon has hue of 5YR to 7.5YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 or 4. It is gravelly

fine sandy loam, gravelly sandy loam, or very gravelly clay loam. Gravel content in the A horizon ranges from 0 to 20 percent.

The B2t horizon has hue of 2.5YR or 5YR, value of 4 to 7 dry and 3 or 4 moist, and chroma of 4 to 6. It is commonly very gravelly clay but ranges to very gravelly clay loam. Content of coarse fragments in the B horizon ranges from 20 percent in the upper part to 80 percent in the lower part. The B3tca horizon is weakly lime cemented in places.

The C horizon has hue of 2.5YR or 5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 4 to 6. It is very gravelly clay or clay loam. Content of coarse fragments in the C horizon ranges from 35 to 90 percent.

Eb, EG—Eba very gravelly clay loam, 0 to 10 percent slopes. This nearly level to rolling soil is on alluvial fans and foot slopes, mainly around the base of mountains. Included in mapping are Nickel and Mohave soils, which make up about 10 percent of the areas mapped at high intensity. Also included are Nickel and Mohave soils and cobbly to stony alluvial drainage channels, which make up about 15 percent of the areas mapped at low intensity.

Permeability is slow, and the available water capacity is low. Runoff is medium. The hazard of erosion is moderate. Roots penetrate to a depth of about 60 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Gravelly range site.

Gila Series

The Gila series consists of deep, well-drained soils on flood plains and alluvial fans. These soils formed in mixed sediments. Slopes are 0 to 3 percent. The vegetation is mesquite, American tarbush, alkali sacaton, tobosa, and annuals. Elevation ranges from 3,800 to 4,500 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 170 to 210 days.

In a representative profile the surface layer is light brownish-gray loam about 3 inches thick. The substratum is stratified light brownish-gray and brown loam, very fine sandy loam, silt loam, and fine sandy loam to a depth of 60 inches or more. The soil is calcareous throughout.

Gila soils are used for irrigated crops, livestock grazing, wildlife, and watershed.

Representative profile of Gila loam, 200 yards east of center of sec. 33, T. 25 S., R. 9 W.

A11—0 to 1 inch, light brownish-gray (10YR 6/2) loam, dark brown (10YR 3/3) moist; weak, medium, platy structure; soft, very friable moist; many fine and medium roots; many fine vesicular pores; slightly calcareous; mildly alkaline; abrupt, smooth boundary.

A12—1 to 3 inches, light brownish-gray (10YR 6/2) loam, dark brown (10YR 3/3) moist; weak, coarse, subangular blocky structure; soft very friable moist; many fine and medium roots; many very fine interstitial pores; slightly calcareous; mildly alkaline; abrupt, smooth boundary.

C1—3 to 15 inches, light brownish-gray (10YR 6/2) loam, dark yellowish brown (10YR 3/4) moist; weak, coarse, subangular blocky structure; soft, very friable moist; common fine and very fine roots; many very fine and few fine interstitial pores; slightly calcareous; mildly alkaline; clear, smooth boundary.

C2—15 to 30 inches, light brownish-gray (10YR 6/2) very fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable moist; few very fine roots; common fine interstitial pores and few medium tubular pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C3—30 to 34 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable moist; few fine roots; few very fine and micro interstitial pores; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

C4—34 to 60 inches, brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable moist; strongly calcareous; moderately alkaline.

The A horizon and C horizon have hue of 7.5YR or 10YR and value of 3 to 5 moist. The A horizon is sandy loam to light clay loam.

Ga—Gila sandy loam. This level soil is on alluvial flood plains in the central part of the county. Slopes are 0 to 1 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is about 8 inches of sandy loam. Included in mapping are small areas of Mimbres and Harkey soils and Gila loam.

Permeability is moderate, and the available water capacity is high. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IIe–2 irrigated; capability subclass VIIe dryland; Sandy range site.

Gh—Gila sandy loam, hummocky. This nearly level to gently undulating soil is on flood plains and alluvial fans in the central part of the county. Slopes are 0 to 3 percent. Hummocks 18 to 36 inches high are numerous. Included in mapping are small areas of Gila loam, Gila sandy loam, and Mimbres and Harkey soils. Also included are some hummocks 36 to 60 inches high.

Permeability is moderate, and the available water capacity is high. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

This soil is used for livestock grazing, wildlife, and watershed. Hummocks must be smoothed before the soil is suitable for irrigation. Capability unit IIe–2 irrigated; capability subclass VIIe dryland; Sand Hills range site.

Gm—Gila loam. This level soil is on flood plains and alluvial fans in the central part of the county. Slopes are 0 to 1 percent. The soil has the profile described as representative of the series. Included in mapping are small areas of Mimbres and Harkey soils and Gila sandy loam.

Permeability is moderate, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit I–1 irrigated; capability subclass VIIc dryland; Bottomland range site.

Graham Series

The Graham series consists of shallow, well-drained soils. These are residual soils that formed in basalt. Slopes are 10 to 25 percent. The vegetation is black

grama, side-oats grama, blue grama, and hairy grama. Elevation ranges from 4,300 to 5,500 feet. The mean annual precipitation is 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 170 to 210 days.

In a representative profile the surface layer is dark-brown stony clay loam about 3 inches thick. The subsoil is reddish-brown clay and gravelly clay 16 inches thick. Basalt is at a depth of about 19 inches.

Graham soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Graham stony clay loam in an area of Graham rocky clay loam, 10 to 25 percent slopes, center of NW¼ sec. 23, T. 28 S., R. 12 W.

A1—0 to 3 inches, dark-brown (7.5YR 4/2) stony clay loam, dark brown (7.5YR 3/2) moist; moderate, medium, granular structure; slightly hard, friable moist, slightly sticky and slightly plastic wet; few fine and very fine roots; few fine interstitial and vesicular pores; mildly alkaline; abrupt, smooth boundary.

B21t—3 to 12 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/4) moist; moderate, medium, subangular blocky structure; very hard, very firm moist, sticky and plastic wet; few fine and very fine roots; common micro interstitial pores and few fine tubular pores; continuous, thick clay films on ped surfaces; mildly alkaline; clear, smooth boundary.

B22t—12 to 16 inches, reddish-brown (5YR 4/3) gravelly clay, dark reddish brown (5YR 3/4) moist; moderate, coarse, angular blocky structure; very hard very firm moist, very sticky and very plastic wet; thick, continuous clay films on ped surfaces and coatings on coarse fragments; few fine and very fine roots; common micro interstitial pores and few fine tubular pores; 15 percent cobbles and gravel; mildly alkaline; gradual, smooth boundary.

B3ca—16 to 19 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; weak, coarse, subangular blocky structure; very hard, firm moist, sticky and plastic wet; moderately calcareous; moderately alkaline; abrupt, smooth boundary.

R—19 inches, basalt that has ¼-inch coating of hard caliche on surface.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4 dry and 2 or 3 moist, and chroma of 2 or 3. It is stony clay loam, stony loam, or gravelly clay loam. The B2t horizon has hue of 5YR or 7.5YR, value of 3 or 4 dry and 2 or 3 moist, and chroma of 2 to 4. It is clay, gravelly clay, or stony clay. The B horizon is mainly noncalcareous, but is moderately to strongly calcareous in the lower part. It rests on lime-coated basalt. Depth to the R horizon is 12 to 20 inches.

GR—Graham rocky clay loam, 10 to 25 percent slopes. This rolling to hilly mapping unit is in the southwestern part of the county. It is 70 percent Graham soil, 10 percent rock outcrop, and 20 percent Akela, Luxor, and Lehmans soils.

Permeability is slow, and the available water capacity is low. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 12 to 20 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Breaks range site.

Harkey Series

The Harkey series consists of deep, well-drained soils on flood plains and alluvial fans. These soils formed in mixed sediments. Slopes are 0 to 3 percent. The vegetation is American tarbush, mesquite, tobosa, sand dropseed, and annuals. Elevation ranges from 4,000 to 4,500 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is grayish-brown silt loam about 4 inches thick. The substratum is light brownish-gray silt loam and grayish brown loamy sand to a depth of 60 inches or more. The soil is calcareous throughout.

Harkey soils are used for irrigated crops, livestock grazing, wildlife, and watershed.

Representative profile of Harkey silt loam, 200 feet east and 100 feet south of the center of SW¼ sec. 25, T. 28 S., R. 9 W.

A11—0 to 2 inches, grayish-brown (10YR 5/2) silt loam, dark yellowish brown (10YR 3/4) moist; weak, medium, platy structure parting to moderate, medium, subangular blocky; soft, very friable moist, slightly sticky wet; many fine and medium roots; many very fine interstitial pores and few fine tubular pores; slightly calcareous; mildly alkaline; abrupt, smooth boundary.

A12—2 to 4 inches, grayish-brown (10YR 5/2) silt loam, dark yellowish brown (10YR 3/4) moist; weak, medium, subangular blocky structure; soft, very friable moist; many fine and medium roots; many very fine interstitial pores; slightly calcareous; mildly alkaline; abrupt boundary.

C1—4 to 54 inches, light brownish-gray (10YR 6/2) silt loam, dark yellowish brown (10YR 3/4) moist; weak, coarse, prismatic structure; soft, very friable moist; common fine roots; many very fine interstitial pores and few tubular pores; slightly calcareous; mildly alkaline; abrupt boundary.

IIC2—54 to 60 inches, grayish-brown (10YR 5/2) loamy sand, dark brown (10YR 3/3) moist; single grained; loose dry and moist; many fine and medium interstitial pores; slightly calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 2 to 4 moist, and chroma of 2 to 4. It is silt loam, loam, or sandy loam. The C horizon has hue of 7.5YR or 10YR and value of 4 to 6 dry and 3 to 5 moist. In many places it is stratified with thin layers that range from silt loam to clay loam but average silt loam. The IIC horizon is gravelly sandy loam, loamy sand, or sand and is below a depth of 40 to 55 inches.

Ha—Harkey sandy loam. This level soil is on alluvial fans and flood plains. Slopes are 0 to 1 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is 10 inches of sandy loam. Included in mapping are small areas of Harkey silt loam and Mimbres soils.

Permeability is moderate or moderately slow, and the available water capacity is high. Runoff is slow. The hazard of water erosion is slight, and the hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, and wildlife. Capability unit IIe–2 irrigated; capability subclass VIIe dryland; Bottomland range site.

Hh—Harkey loam, hummocky. This nearly level to gently undulating soil is along drainageways, on flood plains, and on alluvial fans. Slopes are 0 to 3 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is 5 inches of loam. Included in mapping are small areas of uneroded Mimbres and Harkey soils.

Permeability is moderate or moderately slow, and

the available water capacity is high. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

This soil is used mainly for livestock grazing and wildlife. A few small areas are used for irrigated crops. The hummocks must be smoothed before the soil is suitable for irrigation. Capability unit IIe–2 irrigated; capability subclass VIIe; Sand Hills range site.

Hk—Harkey silt loam. This level soil is on flood plains and alluvial fans, mainly around the larger streams. Slopes are 0 to 1 percent. The soil has the profile described as representative of the series. Included in mapping are small areas of Mimbres and Gila soils and Harkey sandy loam.

Permeability is moderate or moderately slow, and the available water capacity is high. Runoff is slow. The hazard of soil blowing is slight. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit I–1 irrigated; capability subclass VIIc dryland; Bottomland range site.

Hondale Series

The Hondale series consists of deep, well-drained soils on the intermountain valley floor. These soils formed in valley-fill sediments derived from mixed igneous and sedimentary rocks. Slopes are 0 to 3 percent. The vegetation is alkali sacaton, four-wing saltbush, tobosa, and mesquite. Many slickspots are devoid of vegetation. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is light reddish-brown loam about 5 inches thick. The subsoil is reddish-brown to light reddish-brown light clay, heavy clay loam, clay, and sandy clay loam 36 inches thick. The substratum is pinkish-white heavy loam. It has a strong accumulation of lime in the upper part. The soil is calcareous throughout and contains large amounts of exchangeable sodium.

Hondale soils are used for irrigated crops, livestock grazing, and wildlife.

Representative profile of Hondale loam, 100 feet south of the center of the SW¼ sec. 8, T. 24 S., R. 8 W.

A1—0 to 5 inches, light reddish-brown (5YR 6/3) loam, dark reddish gray (5YR 4/2) moist; weak, thin, platy structure parting to moderate, fine, granular; soft, very friable moist, slightly sticky and slightly plastic wet; common fine and very fine roots; many fine and very fine vesicular pores; strongly calcareous, disseminated lime; moderately alkaline; abrupt, smooth boundary.

B21t—5 to 11 inches, reddish-brown (5YR 5/3) light clay, reddish brown (5YR 4/3) moist; strong, fine, columnar structure parting to strong, medium and fine, angular blocky; very hard, friable moist, sticky and plastic wet; few fine and very fine roots; many very fine and micro interstitial pores and few fine and very fine tubular pores; common thin clay films on ped faces; moderately calcareous, disseminated lime; strongly alkaline; clear, smooth boundary.

B22t—11 to 17 inches, reddish-brown (5YR 5/3) heavy clay loam, reddish brown (5YR 4/4) moist; moderate, coarse, prismatic structure parting to strong, medium, subangular blocky; hard, friable moist, sticky and plastic wet; few very fine and fine roots; many very fine and micro interstitial pores; few thin clay films on ped faces and in pores; strongly calcareous, disseminated lime and a few very fine seams of segregated lime; strongly alkaline; clear, wavy boundary.

B31—17 to 35 inches, reddish-brown (5YR 5/4) clay, reddish brown (5YR 5/4) moist; weak, coarse, prismatic structure parting to moderate, medium subangular blocky; soft, very friable moist; sticky and plastic wet; many very fine and micro interstitial pores; strongly calcareous, disseminated lime and a few very fine seams of segregated lime; strongly alkaline; gradual, wavy boundary.

B32ca—35 to 41 inches, light reddish-brown (5YR 6/3) sandy clay loam, reddish brown (5YR 4/3) moist; moderate, fine, subangular blocky structure; slightly hard, very friable moist, slightly sticky and plastic wet; common fine and very fine interstitial and tubular pores; strongly calcareous, segregated lime as medium, irregularly shaped concretions; very strongly alkaline; gradual, wavy boundary.

Cca—41 to 60 inches, pinkish-white (5YR 8/2) heavy loam, pinkish gray (5YR 7/2) moist; massive; hard, very friable moist, slightly sticky wet; common fine and very fine tubular pores; strongly calcareous; strongly alkaline.

The A horizon has hue of 5YR to 10YR, value of 4 to 6 dry and 4 or 5 moist, and chroma of 2 or 3. It is sandy loam, sandy clay loam, loam, or silty clay loam. The B horizon has hue of 5YR or 7.5YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 4 to 6. The B22t horizon is silty clay loam, clay loam, or clay. The C horizon has hue of 5YR or 7.5YR, value of 5 to 8 dry and 4 to 7 moist, and chroma of 1 to 4.

Ho—Hondale loam. This level soil is on the basin floor in the southeastern part of the county. Slopes are 0 to 1 percent. The soil has the profile described as representative of the series. Included in mapping are areas of Hondale soils, strongly alkali; Mohave soils; and Mimbres soils.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of about 60 inches.

This soil is used for irrigated crops, livestock grazing, and wildlife. Only alkali-tolerant plants grow on this soil (fig. 4). Capability unit IVs–11 irrigated; capability subclass VIIs dryland; Salt Flats range site.

Hr—Hondale soils, strongly alkali. This level mapping unit is on the basin floor in the south-central and southeastern parts of the county. Slopes are 0 to 1 percent. The soils have profiles similar to the one described as representative of the series, but the percentage of exchangeable sodium is higher, ranging to more than 30 percent. Included in mapping are areas of Hondale loam, Mohave soils, and Mimbres soils.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of about 60 inches.

This mapping unit is used for livestock grazing and wildlife. It is nearly bare of vegetation (fig. 5). The vegetation is mainly alkali sacaton, seepweed, shadscale, and four-wing saltbush. Capability subclass VIIs dryland; Salt Flats range site.

Hs—Hondale soils, eroded. This nearly level to gently undulating mapping unit is on the basin floor in the south-central part of the county. Slopes are 0 to 3 percent. The surface is hummocky. Hummocks 2 to 5 feet high build up around mesquite and four-wing

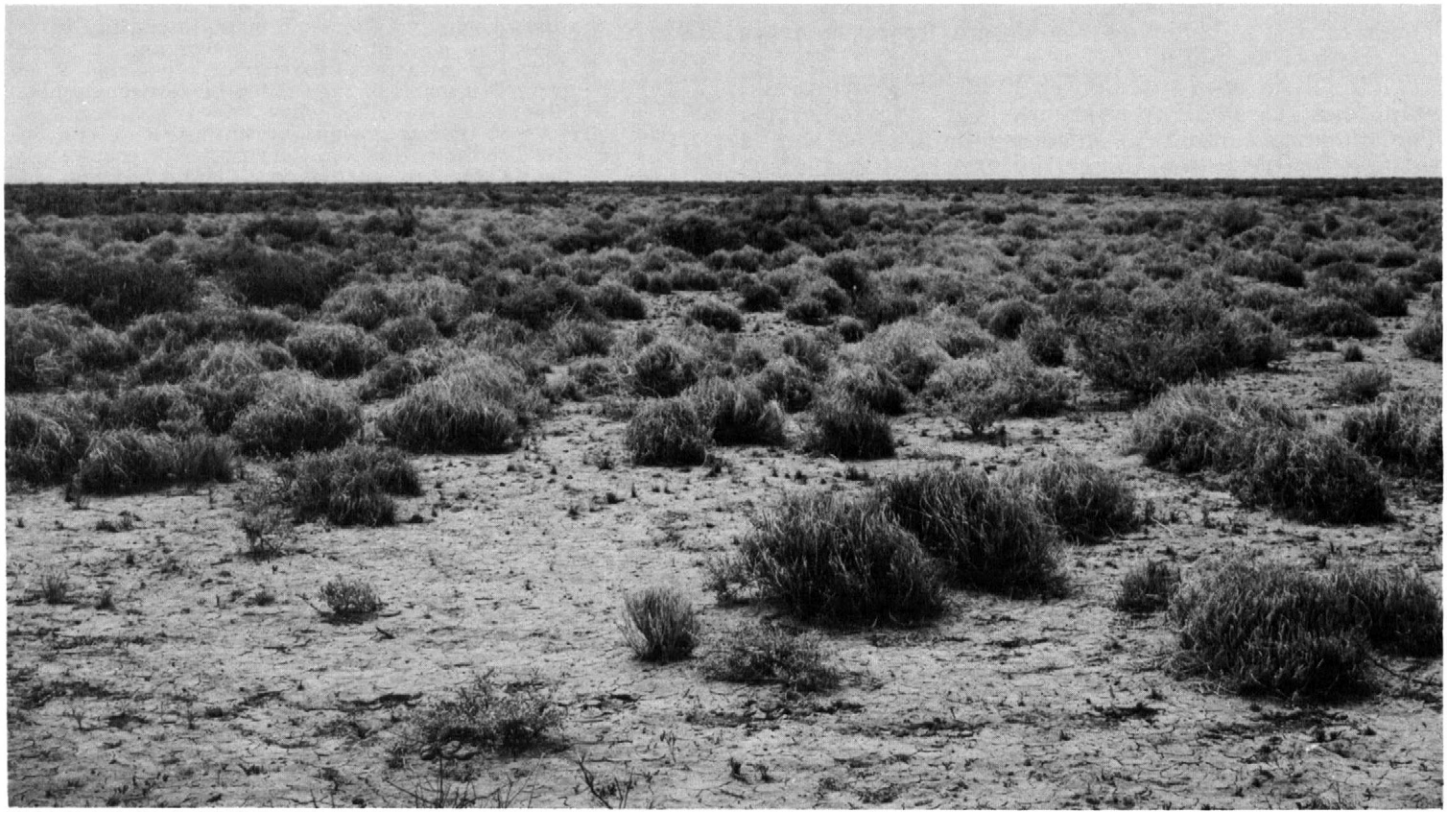

Figure 4.—**Tobosa and alkali sacaton are native species on Hondale loam.**

saltbush. Included in mapping are areas of Hondale loam, Mimbres soils, and Mohave soils.

Permeability is very slow, and the available water capacity is moderate. Runoff is low. The hazard of soil blowing is severe. Roots penetrate to a depth of about 60 inches.

This mapping unit is used for livestock grazing and wildlife. Capability subclass VIIe dryland; Salt Flats range site.

HT—Hondale-Mimbres complex. This nearly level mapping unit is in large areas southeast of the Florida Mountains and is extensive throughout the county. Slopes are 0 to 1 percent. The mapping unit is about 75 percent Hondale soil, 20 percent Mimbres soil, and 5 percent Bluepoint and Harkey soils. The Hondale soil is in the slightly higher positions on the landscape, and the Mimbres soil is in slight depressions. The profiles of the Hondale and Mimbres soils are similar to the ones described as representative of their respective series, but the Hondale soil is strongly affected by alkali and the Mimbres soil is moderately affected.

Permeability is very slow in the Hondale soil and slow in the Mimbres soil. Available water capacity is moderate. The hazard of soil blowing is slight to moderate. Runoff from adjacent areas accumulates on this mapping unit in places. Roots penetrate to a depth of about 60 inches.

This mapping unit is used mainly for livestock grazing and wildlife. Capability subclass VIIs dryland; Salt Flats range site.

HU—Hondale-Bluepoint association. This nearly level to undulating mapping unit is in large areas southeast of the Florida Mountains. Slopes are 0 to 5 percent. The mapping unit is about 45 percent Hondale soil, 45 percent Bluepoint soil, and 10 percent less extensive Mimbres and Mohave soils. The Hondale soil is nearly level. It has a profile similar to the one described as representative of the series, but the surface layer is sandy clay loam about 7 inches thick. The Bluepoint soil is hummocky. It has a profile similar to the one described as representative of the Bluepoint series, but the surface layer and underlying material are loamy sand. The Bluepoint soil is on slightly undulating ridges 1 to 3 feet high. Sand hummocks form around the shrubs on this Bluepoint soil.

Permeability is very slow in the Hondale soil and rapid in the Bluepoint soil. Runoff is slow. The available water capacity is moderate in the Hondale soil, and low in the Bluepoint soil. The hazard of water erosion is slight. The hazard of soil blowing is moderate on the Hondale soil and severe on the Bluepoint soil.

This mapping unit is used mainly for livestock grazing and wildlife. Hondale soil in capability subclass

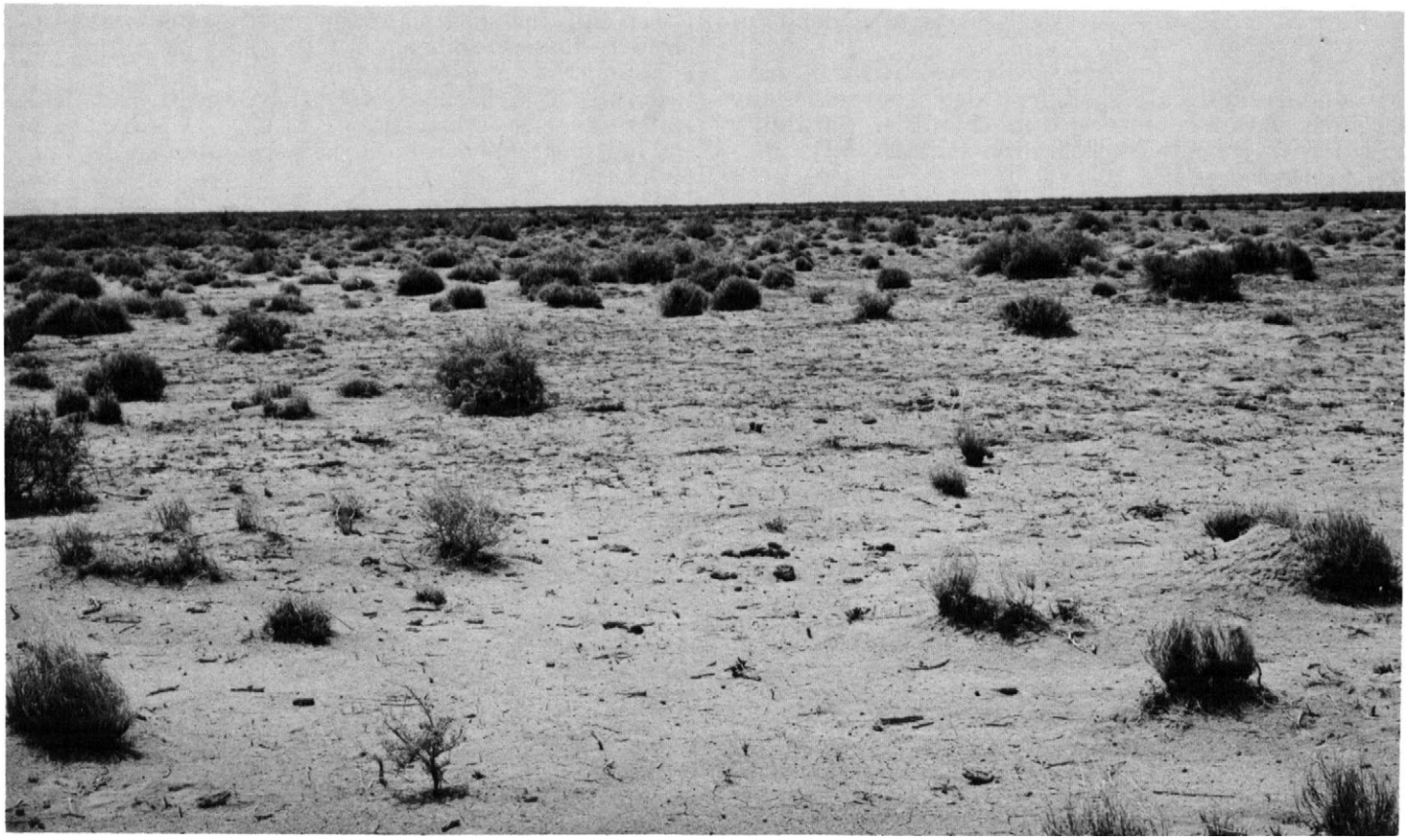

Figure 5.—**Many bare spots on Hondale soils, strongly alkali.**

VIIs dryland; Salt Flats range site. Bluepoint soil in capability subclass VIIe dryland; Sand Hills range site.

Jal Series

The Jal series consists of deep, well-drained soils that are high in content of lime. These soils formed in alluvial material along old beachlines or shorelines of ancient lakes. Slopes are 0 to 3 percent. The vegetation is creosotebush, black grama, and mesa dropseed. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is 8 to 10 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is pale-brown fine sandy loam about 4 inches thick. The upper part of the substratum is very pale brown fine sandy loam about 5 inches thick, and the lower part is white light clay loam to a depth of 60 inches. The soil is strongly calcareous throughout.

Jal soils are used for irrigated crops, livestock grazing, wildlife, and watershed.

Representative profile of Jal fine sandy loam, 50 feet northwest of southeast corner of sec. 1, T. 25 S., R. 11 W.

A1—0 to 4 inches, pale-brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak, medium, platy structure; soft, dry, very friable moist; common very fine and medium roots; many very fine and fine tubular and interstitial pores; strongly calcareous, lime disseminated; moderately alkaline; clear, smooth boundary.

C1—4 to 9 inches, very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak, medium, subangular blocky structure; soft, very friable moist; few very fine and fine roots; common very fine and fine interstitial and tubular pores; strongly calcareous, lime disseminated; moderately alkaline; abrupt, wavy boundary.

C2ca—9 to 60 inches, white (10YR 8/2) light clay loam, very pale brown (10YR 7/3) moist; moderate, medium, subangular blocky structure; very hard, friable moist, slightly sticky wet; strongly calcareous, lime disseminated and common fine to medium soft masses; moderate to strongly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 6 or 7 dry and 4 or 5 moist, and chroma of 2 to 4. The C horizon has hue of 7.5YR or 10YR. In places the Cca horizon is weakly lime cemented.

Ja—Jal fine sandy loam. This nearly level soil is in the south-central part of the county. Slopes are 0 to 3 percent. Included in mapping are small areas of Bluepoint, Dona Ana, and Hondale soils.

Permeability is moderate, and the available water capacity is low. Runoff is slow. The hazard of soil

blowing is moderate. Roots penetrate to a depth of about 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Irrigated crops, especially sorghum, commonly have iron chlorosis. Capability unit IIIs–7 irrigated; capability subclass VIIs dryland; Limy range site.

Karro Series

The Karro series consists of deep, well-drained soils that are high in content of lime. These soils formed in mixed calcareous alluvial sediments on old beachlines and flood plains. Slopes are 0 to 1 percent. The vegetation is creosotebush, winterfat, fluffgrass, black grama, and mesa dropseed. Elevation ranges from 4,000 to 4,800 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is about 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is grayish-brown silty clay loam about 4 inches thick. The subsoil is brown silty clay loam and clay loam and pale-brown loam about 19 inches thick. The substratum is white, weakly lime-cemented caliche of loam texture.

Karro soils are used for irrigated crops and livestock grazing.

Representative profile of Karro silty clay loam, 400 feet south and 400 feet west of northeast corner of sec. 4, T. 24 S., R. 9 W.

A1—0 to 4 inches, grayish-brown (10YR 5/2) silty clay loam, dark grayish brown (7.5YR 4/2) moist; moderate, medium, platy structure; hard, friable moist, slightly sticky and plastic wet; common fine roots; common fine interstitial and vesicular pores; strongly calcareous; mildly alkaline; abrupt, smooth boundary.

B21—4 to 10 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate, medium, subangular blocky structure; very hard, friable moist, sticky and plastic wet; common fine roots; common fine interstitial and tubular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

B22—10 to 17 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate, medium, subangular blocky structure; hard, friable moist, sticky and plastic wet; few fine roots; common very fine interstitial pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

B3ca—17 to 23 inches, pale-brown (10YR 6/3) loam, dark brown (7.5YR 4/4) moist; weak, medium, subangular blocky structure; hard, friable moist, slightly sticky and slightly plastic wet; few fine roots; common very fine interstitial pores; strongly calcareous, common soft lime concretions; moderately alkaline; abrupt, smooth boundary.

Cca—23 to 60 inches, white (10YR 8/2), weakly lime-cemented caliche of loam texture, very pale brown (10YR 7/3) moist; very hard, friable moist; strongly calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 to 4. It is clay loam or silty clay loam, and is mildly alkaline to moderately alkaline. The B horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 to 5 moist, and chroma of 2 through 4. The C horizon has hue of 7.5YR or 10YR, value of 7 or 8 dry and 5 to 8 moist, and chroma of 2 to 4.

Ka—Karro silty clay loam. This nearly level soil is on ancient beachlines and flood plains. Slopes are 0 to 1 percent. Included in mapping are small areas of Mimbres and Jal soils and a Karro silty clay loam that is hummocky.

Permeability is moderately slow, and the available water capacity is low. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IIIs–7 irrigated; capability subclass VIIs dryland; Limy range site.

Ledru Series

The Ledru series consists of shallow, well-drained soils. These soils formed on conglomerate from the upper part of the Sante Fe Formation. Slopes are 10 to 25 percent. The vegetation is tobosa, side-oats grama, black grama, blue grama, and bush muhly. Elevation ranges from 4,200 to 6,000 feet. The mean annual precipitation is about 10 to 14 inches, the mean annual air temperature is 57° to 59° F, and the frost-free season is 170 to 190 days.

In a representative profile the surface layer is brown gravelly clay loam about 4 inches thick. The subsoil is brown silty clay about 13 inches thick. Consolidated conglomerate is at a depth of 17 inches.

Ledru soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Ledru gravelly clay loam, 10 to 25 percent slopes, 900 feet south and 660 feet east of northwest corner of SW¼ sec. 11, T. 20 S., R. 8 W., in ditchbank south of road:

A1—0 to 4 inches, brown (10YR 5/3) gravelly clay loam; dark brown (10YR 3/3) moist; weak, fine, granular structure; soft, very friable moist, sticky and plastic wet; many fine and very fine roots; many fine interstitial pores; mildly alkaline; clear, smooth boundary.

B21t—4 to 13 inches, brown (7.5YR 5/2) silty clay; dark brown (7.5YR 4/2) moist; weak, medium, prismatic structure parting to moderate, medium, subangular blocky; very hard, very friable moist, sticky and plastic wet; many fine and very fine roots; common fine tubular and interstitial pores; many moderately thick clay films on ped faces and in pores; mildly alkaline; clear boundary.

B22tca—13 to 17 inches, brown (7.5YR 5/2) silty clay; dark brown (7.5YR 4/2) moist; moderate, medium, subangular blocky structure; very hard, very friable moist, sticky and plastic wet; few fine and very fine roots; few fine tubular pores and common very fine interstitial pores; moderately thick, continuous clay films on ped faces and in pores; moderately calcareous; mildly alkaline; abrupt, wavy boundary.

IIR—17 inches, consolidated conglomerate; carbonate coated on the surface.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 2 or 3 moist, and chroma of 2 or 3. It is gravelly sandy clay loam or gravelly clay loam. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 or 3. It is silty clay or clay. The IIR horizon is at a depth of 10 to 20 inches.

LC—Ledru gravelly clay loam, 10 to 25 percent slopes. This rolling to hilly soil is on the foothills of higher mountains in the northern part of the county. Areas are deeply dissected by arroyos and stream channels. Included in mapping are small areas of Brenda and Mimbres soils. Also included are soils

similar to this Ledru soil. They are at an elevation of 6,000 feet and adjoin Grant County on the northeast.

Permeability is very slow, and the available water capacity is low. Runoff is rapid. The hazard of water erosion is severe. Roots penetrate to a depth of 10 to 20 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Hills range site.

Lehmans Series

The Lehmans series consists of shallow, well-drained soils on hills and lower mountain slopes. These are residual soils that formed over acid igneous bedrock. Slopes are 0 to 25 percent. The vegetation is black grama, blue grama, side-oats grama, tobosa, and mesquite. Elevation ranges from 4,000 to 6,000 feet. The mean annual precipitation is 9 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 170 to 200 days.

In a representative profile the surface layer is yellowish-brown cobbly loam about 4 inches thick. The subsoil is dark yellowish-brown and yellowish-brown cobbly clay and cobbly sandy clay loam. Acid igneous bedrock is at a depth of about 18 inches.

Lehmans soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Lehmans cobbly loam in an area of Lehmans extremely rocky loam, 10 to 25 percent slopes, 1,000 feet east of northwest corner of sec. 10, T. 22 S., R. 8 W.

A1—0 to 4 inches, yellowish-brown (10YR 5/4) cobbly loam, dark grayish brown (10YR 4/2) moist; weak, fine, granular structure; soft, very friable moist, sticky and plastic wet; many fine and very fine roots; common fine tubular and interstitial pores; 20 percent cobblestones and stones, 5 percent gravel; mildly alkaline; clear, smooth boundary.

B21t—4 to 13 inches, dark yellowish-brown (10YR 4/4) cobbly clay, dark yellowish brown (10YR 3/4) moist; moderate, fine, subangular blocky structure; soft, very friable moist, sticky and plastic wet; many fine and very fine roots; common fine tubular and very fine interstitial pores; 10 percent gravel, 10 percent cobblestones and stones; mildly alkaline; clear, smooth boundary.

B22t—13 to 18 inches, yellowish-brown (10YR 5/4) cobbly sandy clay loam, dark brown (10YR 4/3) moist; weak, fine, subangular blocky structure; soft, very friable moist, slightly sticky and slightly plastic wet; few fine and very fine roots; common very fine interstitial and fine tubular pores; 20 percent gravel, 15 percent cobblestones; mildly alkaline; abrupt, smooth boundary.

R—18 inches, acid igneous bedrock.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 to 4. It is cobbly or stony loam or clay loam. The B2t horizon has hue of 7.5YR or 10YR and value of 4 to 6 dry. It is dominantly cobbly or stony clay or heavy clay loam that is less than 35 percent coarse fragments. Bedrock is at a depth of 10 to 20 inches.

LD—Lehmans very rocky loam, 0 to 10 percent slopes. This nearly level to rolling mapping unit is in areas associated with acid igneous hills throughout the county. It is about 60 percent Lehmans soil; 20 percent rock outcrop; and 20 percent Mimbres soils, Verhalen soils, Lehmans soils that have slopes of 10 to 25 percent, and Lehmans soils that have a surface layer of stony loam.

Permeability is slow, and the available water capacity is very low. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 10 to 20 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Shallow range site.

LK—Lehmans extremely rocky loam, 10 to 25 percent slopes. This rolling to hilly mapping unit is in areas associated with acid igneous hills and mountains throughout the county. It is about 50 percent Lehmans soil; 40 percent rock outcrop; and 10 percent Nickel soils, Upton soils, and Lehmans soils that have a surface layer of stony loam. The less extensive soils are at an elevation of as much as 7,400 feet, where the average air temperature is about 54° F.

Permeability is slow, and the available water capacity is very low. Runoff is rapid. The hazard of water erosion is moderate. Roots penetrate to a depth of 10 to 20 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Hills range site.

Lozier Series

The Lozier series consists of very shallow to shallow, well-drained soils on hills and lower mountainsides. These are residual soils that formed over limestone. Slopes are 0 to 10 percent (fig. 6). The vegetation is agave, sacahuista, black grama, and bush muhly. Elevation ranges from 4,000 to 6,000 feet. The mean annual precipitation is 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 170 to 210 days.

The soil is light brownish-gray stony loam. The surface layer is extremely stony. Limestone is at a depth of 8 inches.

Lozier soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Lozier extremely stony loam in an area of Lozier extremely rocky loam, 0 to 10 percent slopes, 0.5 mile west of southeast corner of sec. 9, T. 26 S., R. 13 W.

A1—0 to 2 inches, light brownish-gray (10YR 6/2) extremely stony loam, dark grayish brown (10YR 4/2) moist; weak, thin, platy structure; soft, very friable moist; few fine and very fine roots; many fine vesicular pores and common fine interstitial pores; 30 percent stones and gravel; moderately calcareous; mildly alkaline; abrupt, smooth boundary.

C—2 to 8 inches, light brownish-gray (10YR 6/2) stony loam, dark brown (10YR 4/3) moist; weak, medium, subangular blocky structure; soft, very friable moist; few fine and very fine roots; few fine interstitial and tubular pores; 45 percent stones and gravel; strongly calcareous; moderately alkaline; abrupt, smooth boundary.

R—8 inches, light-gray (10YR 6/1) limestone.

The A horizon and C horizon have hue of 7.5YR or 10YR, value of 5 or 6 dry and 2 to 4 moist, and chroma of 1 to 4. They are stony loam to stony sandy loam. Limestone is within a depth of 5 to 14 inches. Stones on the surface layer range from 30 to 50 percent.

LM—Lozier extremely rocky loam, 0 to 10 percent

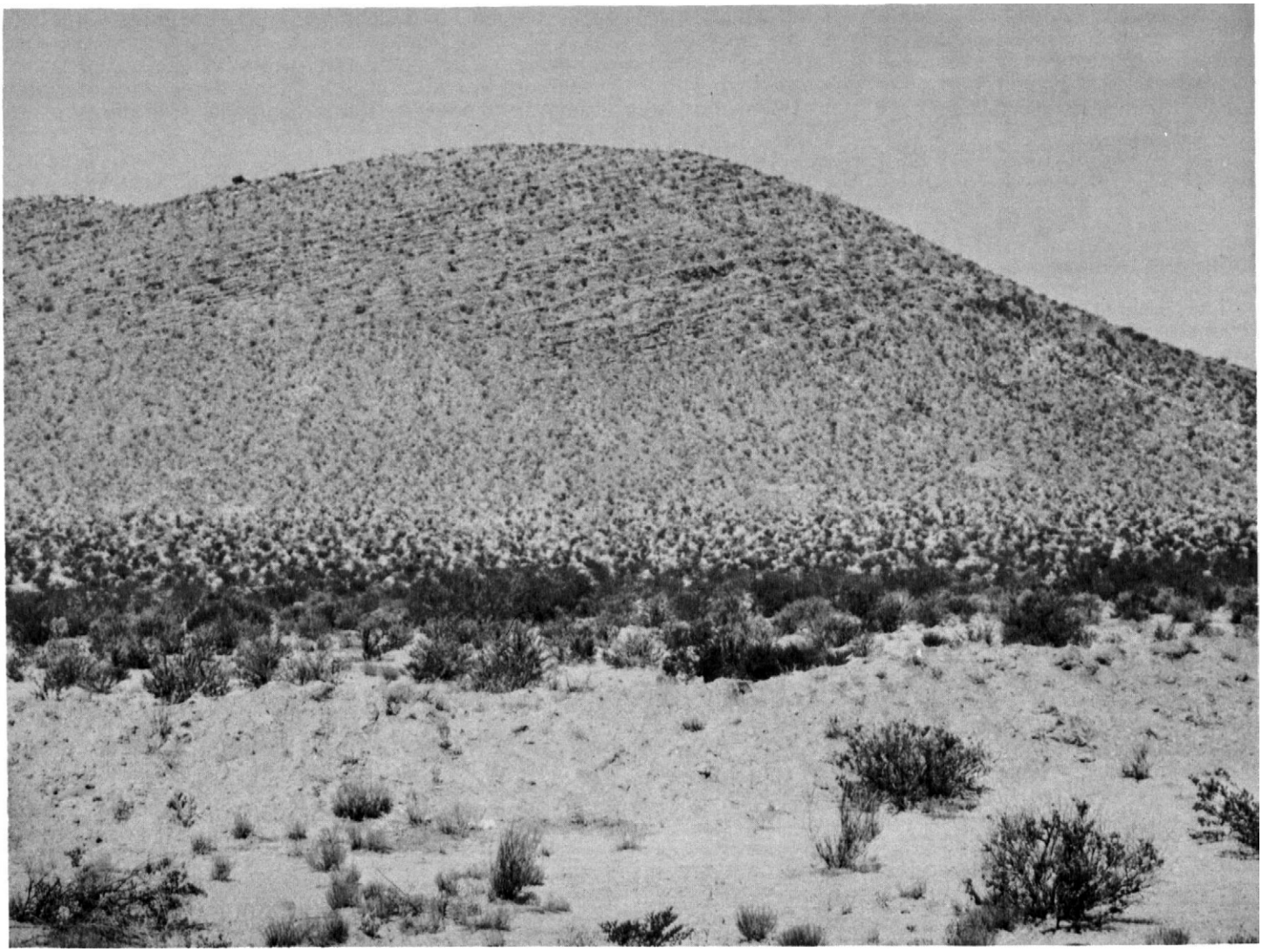

Figure 6.—**Lozier soils on toe slopes. The foreground shows Mohave sandy loam, 0 to 1 percent slopes.**

slopes. This nearly level to rolling mapping unit is in limestone areas in the south-central and southwestern parts of the county. It is about 65 percent Lozier soil; 25 percent rock outcrop; and 25 percent Lehmans soils, Nickel soils, Rock land, and steeper Lozier soils (fig. 7).

Permeability is moderate, and the available water capacity is very low. Runoff is rapid. The hazard of water erosion is moderate to severe. Roots penetrate to a depth of 5 to 14 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Limestone Hills range site.

Luxor Series

The Luxor series consists of very shallow to shallow, well-drained soils. These are residual soils that formed over the rhyolite associated with igneous hills. Slopes are 0 to 5 percent. The vegetation is tobosa, black grama, and fluffgrass. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is 8 to 11 inches, mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

The surface layer is brown extremely stony sandy loam and dark yellowish-brown sandy loam about 5 inches thick. The subsoil is yellowish-brown gravelly clay loam about 9 inches thick. The substratum is highly weathered, white rhyolite about 4 inches thick. Hard rhyolite is at a depth of about 18 inches. It generally has a thin layer of lime on the surface.

Luxor soils are used mainly for livestock grazing, wildlife, and watershed.

Representative profile of Luxor extremely stony sandy loam in southeast corner of NW¼NW¼ sec. 27, T. 22 S., R. 12 W.

A11—0 to 2 inches, brown (10YR 5/3) extremely stony sandy loam, dark yellowish brown (10YR 3/4) moist; weak, thin, platy and weak, granular structure; soft, very friable moist; many fine roots; many fine interstitial pores; mildly alkaline; abrupt, smooth boundary.

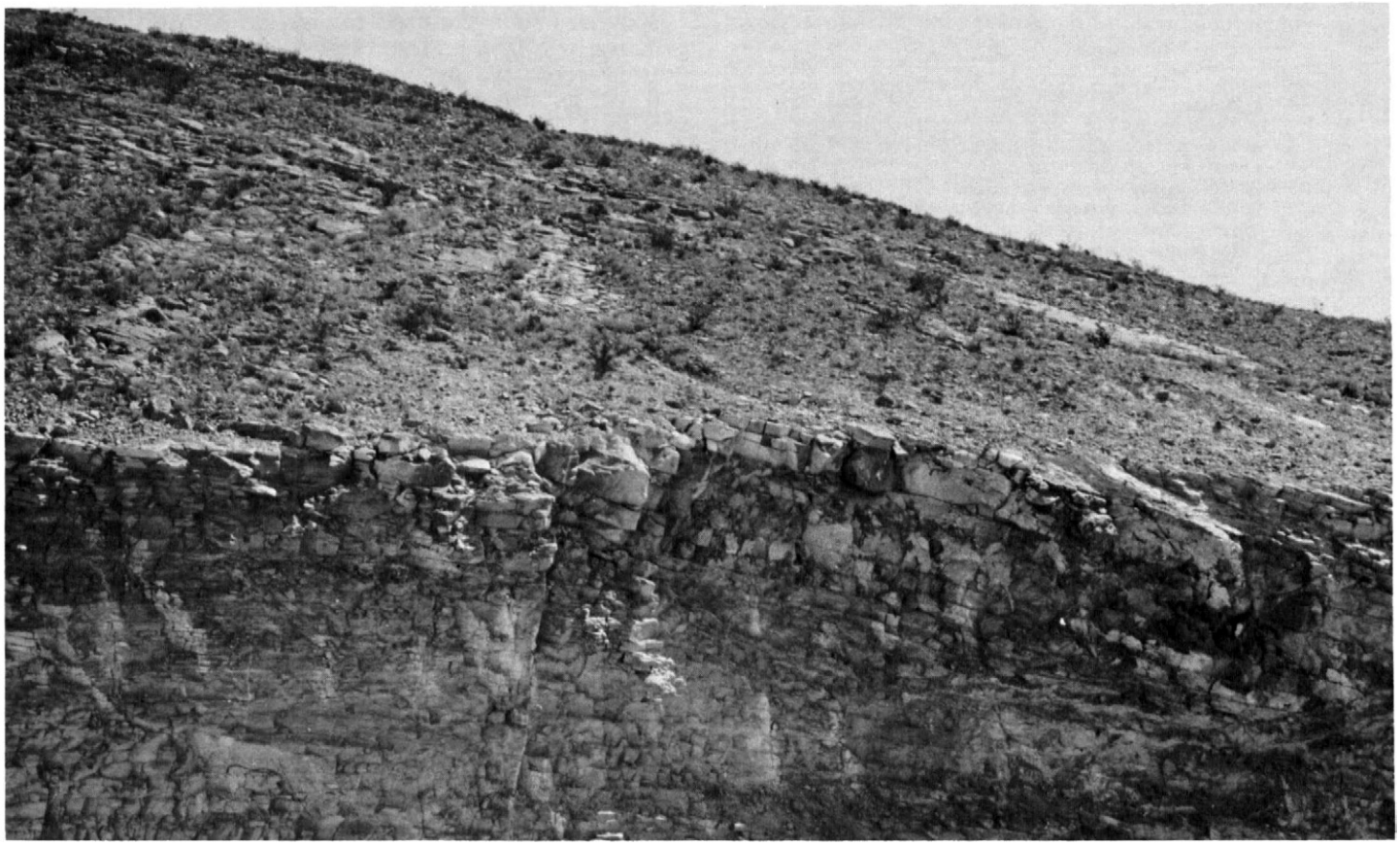

Figure 7.—**Rock outcrop in an area of Lozier extremely rocky loam, 0 to 10 percent slopes.**

A12—2 to 5 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; weak, subangular blocky structure; slightly hard, very friable moist; many fine roots; many fine interstitial pores; slightly calcareous; mildly alkaline; clear, smooth boundary.

B2t—5 to 14 inches, yellowish-brown (10YR 5/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate, medium, subangular blocky structure; soft, very friable moist, slightly sticky and slightly plastic wet; few thin patchy clay films on ped surfaces; few fine roots; common fine tubular and very fine interstitial pores; strongly calcareous, disseminated lime; moderately alkaline; clear, wavy boundary.

C—14 to 18 inches, highly weathered, white (10YR 8/1) rhyolite, thin patchy lime coatings on bottom side of fragments.

R—18 inches, rhyolite with a thin surface layer of lime.

The A and B horizon has hue of 7.5YR or 10YR, value of 3 or 4 moist, and chroma of 2 to 4. The A11 horizon is gravelly loam, gravelly sandy loam, or extremely stony sandy loam. The B horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 or 4 moist, and chroma of 3 or 4. It is gravelly or stony clay loam to gravelly or stony clay and is 15 to 35 percent rock fragments. Rhyolite is at a depth of 7 to 20 inches. In places a thin coating of lime is on the bedrock. Stones cover 15 to 50 percent of the surface layer.

LU—Luxor extremely stony sandy loam. This nearly level to undulating soil is on low hills and uplands in the west-central part of the county. Slopes are 0 to 5 percent. Included in mapping are areas of Upton, Mimbres, and Lehmans soils and scattered rock outcrops.

Permeability is slow, and the available water capacity is very low. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 7 to 20 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Shallow range site.

Maricopa Series

The Maricopa series consists of deep, well-drained soils. These soils formed in sandy, recent alluvial sediments. Slopes are 0 to 3 percent. The vegetation is yucca, mesquite, fluffgrass, dropseeds, and annuals. Elevation ranges from 4,000 to 4,700 feet. The mean annual precipitation is 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer and upper part of the substratum to a depth of about 22 inches are brown sandy loam. Below this to a depth of 60 inches or more is brown gravelly loamy sand.

Maricopa soils are used for irrigated crops, livestock grazing, and wildlife.

Representative profile of Maricopa sandy loam, 300 feet north of southwest corner of sec. 3, T. 26 S., R. 9 W., east side of road:

A1—0 to 4 inches, brown (10YR 5/3) light sandy loam, dark yellowish brown (10YR 3/4) moist; weak, thin, platy structure; soft, very friable moist; few

medium and fine roots; many fine interstitial pores; mildly alkaline; abrupt, smooth boundary.

C1—4 to 22 inches, brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; weak, coarse, prismatic structure; soft, very friable moist; few fine and very fine roots; common fine tubular and interstitial pores; slightly calcareous; mildly alkaline; clear, smooth boundary.

IIC2ca—22 to 60 inches, brown (10YR 5/3) gravelly loamy sand, dark yellowish brown (10YR 3/4) moist; single grained; loose dry and moist; moderately calcareous, lime is disseminated as thin patchy coatings on bottoms of some coarse fragments; moderately alkaline.

The A horizon and C horizon have value of 5 or 6 dry and chroma of 2 to 4. They are sandy loam or fine sandy loam. The IICca horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 3 or 4. It is generally gravelly loamy sand, but in places is loamy sand or sand. Depth to the IICca horizon ranges from 17 to 30 inches. In places thin strata of silt loam are in this material. Content of gravel ranges from 15 to 50 percent.

Ma—Maricopa sandy loam. This nearly level to gently undulating soil is on alluvial fans in the central part of the county. Slopes are 0 to 3 percent. The soil has the profile described as representative of the series. Included in mapping are small areas of Gila, Bluepoint, and Mohave soils.

Permeability is moderately rapid, and the available water capacity is low. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, and wildlife. Capability unit IIIe–11 irrigated; capability subclass VIIe dryland; Sandy range site.

Mah—Maricopa sandy loam, hummocky. This nearly level to gently undulating soil is on wind-hummocked alluvial fans in the central part of the county. Slopes are 0 to 3 percent. Sand hummocks are 2 to 6 feet high, and the surface soil between the hummocks has been removed. Included in mapping are small areas of Bluepoint and Gila soils.

Permeability is moderately rapid, and the available water capacity is low. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches.

This soil is used for livestock grazing and wildlife. It is suitable for irrigation if hummocks are smoothed. Capability unit IIIe–11 irrigated; capability subclass VIIe dryland; Sand Hills range site.

Mimbres Series

The Mimbres series consists of deep, well-drained soils. These soils formed in mixed alluvium deposited on flood plains, terraces, and alluvial fans. Slopes are 0 to 3 percent. The vegetation is mesquite, four-wing saltbush, creosotebush, tobosa, alkali sacaton, and annuals. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 51° to 62° F, and the frost-free season is 170 to 210 days.

In a representative profile the surface layer is light brownish-gray silty clay loam about 3 inches thick. The subsoil is pale-brown silty clay loam about 33 inches thick. The substratum is very pale brown silty clay loam and pale-brown sandy clay loam to a depth of 60 inches or more.

Mimbres soils are used for irrigated crops, livestock grazing, wildlife, and watershed.

Representative profile of Mimbres silty clay loam, 600 feet north and 600 feet west of southeast corner of sec. 28, T. 24 S., R. 9 W.

A1—0 to 3 inches, light brownish-gray (10YR 6/2) silty clay loam, dark yellowish brown (10YR 3/4) moist; weak, medium, subangular blocky structure; soft, very friable moist; many very fine and fine roots; common very fine and fine tubular and interstitial pores; mildly alkaline; clear, smooth boundary.

B21—3 to 16 inches, pale-brown (10YR 6/3) silty clay loam, dark yellowish brown (10YR 3/4) moist; moderate, medium, subangular blocky structure; hard, very friable moist, sticky and plastic wet; many very fine and fine roots; common very fine and fine interstitial and tubular pores; slightly calcareous in upper part, moderately calcareous in lower part; moderately alkaline; clear, smooth boundary.

B22ca—16 to 36 inches, pale-brown (10YR 6/3) silty clay loam, dark yellowish brown (10YR 3/4) moist; moderate, medium, subangular blocky structure; hard, very friable moist, sticky and plastic wet; common very fine and fine roots; common very fine and fine interstitial and tubular pores; moderately calcareous, lime disseminated and segregated in fine veins and threads; moderately alkaline; clear, smooth boundary.

C1ca—36 to 42 inches, very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; moderate, medium, subangular blocky structure; hard, friable moist, sticky and plastic wet; few very fine roots; many very fine interstitial pores and few very fine tubular pores; moderately calcareous, lime disseminated and in few scattered soft masses; moderately alkaline; abrupt, smooth boundary.

IIC2—42 to 60 inches, pale-brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak, medium, subangular blocky structure; slightly hard, very friable moist; common fine interstitial pores and few tubular pores; moderately calcareous, lime disseminated; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 2 to 4. It is loam, clay loam, or silty clay loam. The B horizon has hue of 7.5YR or 10YR and value of 6 or 7 dry and 3 to 5 moist. It is clay loam or silty clay loam. The C1ca horizon has hue of 7.5YR or 10YR, value of 4 or 5 moist, and chroma of 3 or 4. In places sand and gravel is at a depth of 48 inches, but is commonly below a depth of 60 inches.

Mb—Mimbres loam. This level soil is at the outer edges of alluvial fans, in valley-fill sediments. Slopes are 0 to 1 percent. The soil has a profile similar to the one described as representative of the series, but the surface layer is 8 inches of loam. Included in mapping are small areas of Bluepoint and Hondale soils. Also included are soils similar to this Mimbres soil. They are in the northwestern part of the county at higher elevations, where temperatures are cooler.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit I–1 irrigated; capability subclass VIIc dryland; Loamy range site.

Mc—Mimbres silty clay loam. This level soil is at the outer edges of alluvial fans, in valley-fill sediments. Slopes are 0 to 1 percent. The soil has the profile described as representative of the series. Included in mapping are small areas of Bluepoint soils, Hondale

soils, Mimbres loam, and Mimbres silty clay loam, alkali.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit I–1 irrigated; capability subclass VIIc dryland; Clayey range site.

Md—Mimbres silty clay loam, alkali. This level soil is at the outer edges of alluvial fans, in valley-fill sediments. Slopes are 0 to 1 percent. The soil has a profile similar to the one described as representative of the series, but it is alkali affected and the subsoil and substratum are strongly alkaline. Included in mapping are small areas of Mimbres silty clay loam and Hondale soils.

Permeability is slow, and the available water capacity is moderate. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IVs–10 irrigated; capability subclass VIIs dryland; Salt Flats range site.

MM—Mimbres soils. This nearly level mapping unit is on fans and in valley-fill sediments. Slopes are 0 to 1 percent. The unit is generally about 60 percent Mimbres silty clay loam; 20 percent Mimbres loam; and 20 percent Verhalen silty clay loam, Hondale soils, and soils similar to Mimbres soils. The similar soils are in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is about 55° to 57° F.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIc dryland; Clayey range site.

Mn—Mimbres soils, eroded. This mapping unit is nearly level to gently undulating. Slopes are 0 to 3 percent. Hummocks are 36 to 72 inches high and are silty clay loam to loamy fine sand. They occur as small irregularly shaped areas that have been exposed to soil blowing. Included in mapping are small areas of Mimbres silty clay loam.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. It is suitable for irrigation if hummocks are smoothed. Capability subclass VIIe dryland; Sand Hills range site.

MR—Mimbres and Verhalen soils. This nearly level mapping unit is on alluvial fans and valley-fill sediments. Slopes are 0 to 1 percent. About 50 percent of the total acreage of this unit is Mimbres silty clay loam, about 45 percent is Verhalen silty clay loam, and 5 percent is included areas of Harkey soils, Riverwash, and similar soils in the northern part of the county, at an elevation of as much as 6,000 feet where the mean annual air temperature is about 55° to 57°F.

This mapping unit recieves beneficial additional runoff from surrounding soils. Runoff is slow. Permeability is moderately slow in the Mimbres soil and very slow in the Verhalen soil. The available water capacity is high. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing and wildlife. Mimbres soil in capability subclass VIIc dryland; Verhalen soil in capability subclass VIIs dryland; both soils in Bottomland range site.

Mimbres Variant

The Mimbres variant is a deep, well-drained soil. It formed in mixed alluvium deposited on terraces and alluvial fans. Slopes are 0 to 1 percent. The vegetation is four-wing saltbush, creosotebush, tobosa, alkali sacaton, and annuals. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 49° to 62° F, and the frost-free season is 170 to 210 days.

In a representative profile the surface layer is brown silty clay loam 3 inches thick. The subsoil is brown silty clay loam 18 inches thick. The substratum is brown loamy sand to coarse sand to a depth of 60 inches or more.

The Mimbres variant is used for irrigated crops, livestock grazing, wildlife, and watershed.

Representative profile of Mimbres silty clay loam, sandy subsoil variant, 50 yards south and 50 feet west of cattleguard on oil road in NW¼ sec. 16, T. 24 S., R. 9 W.

A1—0 to 3 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak, very thin, platy structure; slightly hard, friable moist, sticky and plastic wet; common fine and very fine roots; common fine vesicular pores; mildly alkaline; abrupt boundary.

B21—3 to 14 inches, brown (7.5YR 5/2) silty clay loam, dark brown (7.5YR 4/3) moist; weak, medium, subangular blocky structure; hard, friable moist, sticky and very plastic wet; common fine and very fine roots; many fine interstitial pores and very fine tubular pores; slightly calcareous; moderately alkaline; abrupt boundary.

B22ca—14 to 21 inches, brown (10YR 5/3) silty clay loam, dark yellowish brown (10YR 3/4) moist; moderate, medium, subangular blocky structure; slightly hard, very friable moist, slightly sticky and plastic wet; few fine and very fine roots; few medium tubular pores; strongly calcareous, numerous distinct lime mycelia; moderately alkaline; clear boundary.

IIC1ca—21 to 25 inches, grayish-brown (10YR 5/2) sandy loam, dark yellowish brown (10YR 3/4) moist; weak, very fine, subangular blocky structure; soft, very friable moist; few fine roots; common fine tubular pores; strongly calcareous; moderately alkaline; clear boundary.

IIC2—25 to 36 inches, brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 3/4) moist; massive; soft, very friable moist; common fine interstitial pores; slightly calcareous; mildly alkaline; clear boundary.

IIC3—36 to 60 inches, brown (10YR 5/3) coarse sand, dark yellowish brown (10YR 4/4) moist; single grained; loose dry and moist; common fine interstitial pores; slightly calcareous; mildly alkaline.

The A horizon has hue of 7.5YR and 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 2 or 3. It is silty clay loam or clay loam. The B horizon has value of 5 or 6 dry and 3 or 4 moist. In some places thin strata of silt loam

are throughout the IIC horizon. Depth to the IIC horizon is 20 to 38 inches.

Me—Mimbres silty clay loam, sandy subsoil variant. This level soil is at the outer edges of alluvial fans, in valley-fill sediments. Slopes are 0 to 1 percent. Included in mapping are small areas of Mimbres silty clay loam.

Permeability is moderately slow to a depth of about 21 inches, and is moderately rapid or rapid below that depth. The available water capacity is moderate. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 24 to 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IIs–4 irrigated; capability subclass VIIs dryland; Clayey range site.

Mohave Series

The Mohave series consists of deep, well-drained soils. These soils formed on old alluvial fans in mixed valley-fill sediments. Slopes are 0 to 3 percent. The vegetation is tobosa, yucca, mesquite, black grama, and annual weeds. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is brown sandy clay loam 8 inches thick. The subsoil is reddish-brown and yellowish-red sandy clay loam and clay loam about 44 inches thick. The substratum is light-brown, calcareous clay loam and has prominent soft lime masses. The upper 8 inches of the soil is non-calcareous.

Mohave soils are used for irrigated crops, livestock grazing, wildlife, and watershed (fig. 8).

Representative profile of Mohave sandy clay loam, 0 to 1 percent slopes, in southwest corner of SE¼ sec. 2, T. 24 S., R. 11 W.

A1—0 to 8 inches, brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak, thin, platy structure; soft, very friable moist, slightly sticky wet; many very fine and fine roots; many very fine and fine tubular and interstitial pores; mildly alkaline; clear, wavy boundary.

B1—8 to 22 inches, reddish-brown (5YR to 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate, fine, subangular blocky structure; hard, friable moist, slightly sticky wet; common very fine and fine roots; many very fine and fine tubular pores and common very fine and fine interstitial pores; few thin clay films on ped faces and in pores; calcareous, lime disseminated; moderately alkaline; clear, smooth boundary.

B21t—22 to 28 inches, yellowish-red (5YR 4/8) sandy clay loam, dark red (2.5YR 3/6) moist; moderate, medium, subangular blocky structure; hard, friable moist, slightly sticky wet; common very fine roots; common very fine tubular pores; common thin clay films on ped faces and in pores; calcareous, lime disseminated; moderately alkaline; clear, smooth boundary.

B22tca—28 to 52 inches, yellowish-red (5YR 4/6) clay loam, reddish brown (2.5YR 4/4) moist; moderate, coarse, subangular blocky structure; very hard, friable moist, slightly sticky wet; few very fine tubular pores; common thin clay films on ped faces; calcareous, lime disseminated and segregated in common, medium, soft lime masses; moderately alkaline; gradual, smooth boundary.

Cca—52 to 60 inches, light-brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate, medium, subangular blocky structure; very hard, friable moist, slightly sticky wet; calcareous, lime disseminated segregated into few fine soft masses; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 4 to 6. It is commonly sandy clay loam, but ranges from sandy loam to sandy clay loam. The B1 horizon and B2t horizon have hue of 2.5YR or 5YR, value of 4 or 6 dry and 3 or 5 moist, and chroma of 3 to 8. The Cca horizon has hue of 5YR to 7.5YR, value of 5 or 6 dry and 3 to 5 moist, and chroma of 3 or 4.

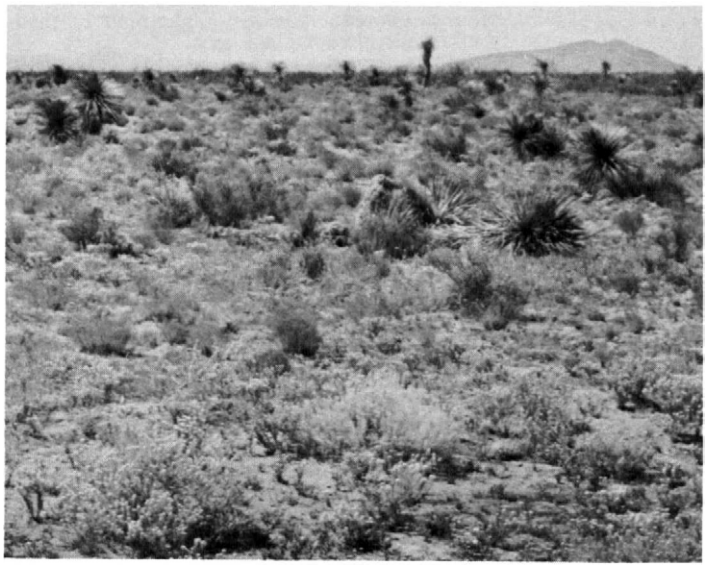

Figure 8.—**Area of Mohave sandy loam, 0 to 1 percent slopes, used as range.**

Ms—Mohave sandy loam, 0 to 1 percent slopes. This level soil is mainly in the central part of the county. It is on old alluvial fans and valley-fill slopes, generally above the valley floor. It has a profile similar to the one described as representative of the series, but the surface layer is 6 inches of sandy loam. Included in mapping are small areas of Mohave sandy clay loam, 0 to 1 percent slopes, and areas where slope is more than 1 percent. Also included are soils similar to this Mohave soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is about 55° to 57° F.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IIe–2 irrigated; capability subclass VIIe dryland; Sandy range site.

Mt—Mohave sandy clay loam, 0 to 1 percent slopes. This level soil is mainly in the central part of the county. It is on sediments, generally above the recent valley floors. It has the profile described as representative of the series. Included in mapping are small areas of Mohave sandy loam, 0 to 1 percent slopes, and Stellar soils. Also included are soils similar to this Mohave soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual temperature is about 55° to 57° F.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit I–1 irrigated; capability subclass VIIc dryland; Loamy range site.

MU—Mohave sandy clay loam, 0 to 3 percent slopes. This nearly level to gently undulating soil is in the western and northern parts of the county. It is on old alluvial fans and valley-fill slopes, generally above the recent valley floor. It has a profile similar to the one described as representative of the series, but it is steeper. Included in mapping are small areas of Mohave sandy loam, 0 to 1 percent slopes, and Bluepoint and Stellar soils. Also included are soils similar to this Mohave soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual temperature is about 55° to 57° F.

Permeability is moderately slow, and the available water capacity is high. Runoff is medium. The hazard of erosion is slight. Roots penetrate to a depth of about 60 inches.

This soil is suited to livestock grazing, wildlife, and watershed. Capability subclass VIIc dryland; Loamy range site.

Mv—Mohave-Pintura complex, eroded. This wind-eroded mapping unit occurs throughout the county. Slopes are 0 to 3 percent. The unit is about 50 percent Mohave soil, 40 percent Pintura soil, and 10 percent Berino, Simona, Hondale, and Dona Ana soils, blowout spots, and wind-shifted, active sand dunes. The Mohave soil is nearly level and is between sand hummocks, which consist of the Pintura soil. The profiles of the Mohave and Pintura soils are similar to the ones described as representative of their respective series, but the Mohave soil has a surface layer of sandy loam and the Pintura soil has a surface layer of loamy sand.

Permeability is moderately slow in the Mohave soil and rapid in the Pintura soil. The available water capacity is high in the Mohave soil and low in the Pintura soil. Runoff is slow. The hazard of water erosion is slight, and the hazard of soil blowing is severe. Roots penetrate to a depth of about 60 inches.

This mapping unit is used for livestock grazing and wildlife. It is suitable for irrigated crops if leveled or if the hummocks are smoothed. Capability unit IVe–11 irrigated; capability subclass VIIe dryland; Mohave soil in Sandy range site, Pintura soil in Sand Hills range site.

Nickel Series

The Nickel series consists of deep, well-drained soils. These soils formed on old gravelly alluvial fans of mixed materials, commonly around the base of hills and mountains. Slopes are 0 to 9 percent. The native vegetation is creosotebush, American tarbush, fluffgrass, bush muhly, dropseed, and black grama. Elevation ranges from 4,000 to 5,500 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 170 to 210 days.

In a representative profile the surface layer is dark yellowish-brown very gravelly sandy loam about 4 inches thick. The upper 8 inches of the substratum is yellowish-brown, strongly calcareous very gravelly loam. The lower part is brown to light-brown very gravelly loam to cobbly loam to a depth of 60 inches or more. It is strongly calcareous and has lime coatings on coarse fragments. The soil is gravelly throughout and lime accumulation begins at a depth of 10 to 16 inches.

Nickel soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Nickel very gravelly sandy loam, 3 to 9 percent slopes, in SE¼NE¼ sec. 25, T. 22 S., R. 8 W.

A11—0 to 1 inch, dark yellowish-brown (10YR 4/4) very gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; single grained; loose dry and moist; common fine and very fine roots and few medium roots; common fine vesicular and interstitial pores; 50 percent gravel; mildly alkaline; abrupt, smooth boundary.

A12—1 inch to 4 inches, dark yellowish-brown (10YR 4/4) very gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; weak, thin, platy structure; soft, very friable moist; common fine and very fine roots and few medium roots; many fine and medium interstitial pores; 50 percent gravel; moderately calcareous; mildly alkaline; clear boundary.

C1ca—4 to 12 inches, yellowish-brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, friable moist; few fine and common very fine roots; many fine and medium interstitial pores; 50 percent gravel; strongly calcareous, common fine faint lime mycelia, lime coatings on gravel; moderately alkaline; abrupt, wavy boundary.

C2ca—12 to 18 inches, brown (7.5YR 5/4) very gravelly loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable moist; few interstitial pores and discontinuous tubular pores; 60 percent angular, lime-coated gravel, caliche fragments, and cobbles; strongly calcareous; moderately alkaline; clear boundary.

C3ca—18 to 60 inches, light-brown (7.5YR 6/4) cobbly loam, brown (7.5YR 5/4) moist; massive; soft, friable moist; few fine interstitial pores; strongly calcareous, common fine lime mycelia; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 to 5 moist, and chroma of 4 or 5. It is loam, gravelly loam, or very gravelly sand loam. The C horizon has value of 5 to 8 dry and 3 to 7 moist and chroma of 2 to 4. It is very gravelly loam, very gravelly sandy loam, or cobbly loam, is more than 35 percent coarse fragments, and in many places is stony and is weakly cemented with lime.

NK—Nickel very gravelly sandy loam, 3 to 9 percent slopes. This undulating to gently rolling soil is on old alluvial fans and low ridges around the base of hills or mountains. A few small areas were mapped at high intensity. The soil has the profile described as representative of the series. Included in mapping are small areas of a Nickel soil that has a stony loam surface layer, areas where slope is less than 3 percent, and areas of Sonoita and Eba soils. Also included are small areas of soils similar to this Nickel soil that are in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is 55° to 57° F.

Permeability is moderately slow, and the available water capacity is low. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 60 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Limy range site.

NT—Nickel-Tres Hermanos complex. This mapping unit is in the south-central part of the county. Slopes are 0 to 3 percent. The unit is about 65 percent Nickel soil, 20 percent Tres Hermanos soil, and 15 percent Lehmans and Sonoita soils. The profile of the Nickel soil is similar to the one described as representative of the Nickel series, but it is less sloping and contains less gravel in the surface layer. The profile of the Tres Hermanos soil is similar to the one described as representative of the Tres Hermanos series, but it is less sloping and has a gravelly sandy loam surface layer about 3 inches thick.

Permeability is moderately slow, and the available water capacity is low. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Limy range site.

Onite Series

The Onite series consists of deep, well-drained soils. These soils formed in mixed alluvial sediments. Slopes are 0 to 5 percent. The native vegetation is yucca, black grama, dropseed, and annuals. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is brown loamy sand about 8 inches thick. The subsoil is reddish-brown sandy loam about 19 inches thick. The substratum is strong-brown loamy sand and gravelly sand to a depth of 60 inches or more. The soil is noncalcareous to a depth of about 42 inches.

Onite soils are used for livestock grazing and wildlife.

The Onite soils of Luna County are mapped only with Bluepoint soils.

Representative profile of Onite loamy sand in an area of Bluepoint-Onite association, ½ mile north and ½ mile west of southeast corner of sec. 31, T. 23 S., R. 12 W.

A11—0 to 3 inches, brown (10YR 5/3) loamy sand, dark brown (7.5YR 4/4) moist; weak, thin, platy structure; soft, very friable moist; few fine roots; common fine interstitial pores; mildly alkaline; clear, smooth boundary.

A12—3 to 8 inches, brown (7.5YR 5/4) loamy sand, dark brown (7.5YR 4/4) moist; massive; soft, very friable moist; few fine and very fine roots; common fine interstitial pores; mildly alkaline; gradual, smooth boundary.

B2t—8 to 27 inches, reddish-brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; weak, medium, subangular blocky structure; very hard, friable moist, slightly sticky wet; few very fine roots; common fine interstitial and few tubular pores; few thin clay film coatings on sand grains and in pores; mildly alkaline; gradual, smooth boundary.

C1—27 to 42 inches, strong-brown (7.5YR 5/6) loamy sand, dark brown (7.5YR 4/4) moist; massive; hard, friable moist; few fine interstitial pores; mildly alkaline; clear boundary.

IIC2—42 to 60 inches, gravelly sand; slightly calcareous, mildly alkaline.

The A horizon has hue of 5YR to 10YR, value of 4 or 5 dry and moist, and chroma of 2 to 4. The B2t horizon has hue of 5YR or 7.5YR, value of 4 or 5 dry and 3 or 4 moist, and chroma of 3 or 4. It is light sandy clay loam or sandy loam. The C horizon has hue of 7.5YR or 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 4 to 6. It ranges from loamy sand to sand or gravelly sand.

Pintura Series

The Pintura series consists of deep, somewhat excessively drained soils. These soils formed as small hummocks in wind-deposited sandy sediments. Slopes are 0 to 5 percent. The vegetation is mesquite, yucca, and dropseeds. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the soil is brown fine sand to a depth of 60 inches. It is generally noncalcareous.

Pintura soils are used for livestock grazing and wildlife.

Representative profile of Pintura fine sand in an area of Pintura-Berino complex, eroded, in northwest corner of sec. 11, T. 29 S., R. 5 W.

A1—0 to 2 inches, brown (7.5YR 5/4) fine sand, dark brown (7.5YR 4/4) moist; single grained; loose dry and moist; few fine roots; common fine interstitial pores; mildly alkaline; clear, smooth boundary.

C—2 to 60 inches, brown (7.5YR 5/4) fine sand, dark brown (7.5YR 4/4) moist; single grained; loose dry and moist; few fine roots in upper 36 inches; few fine interstitial pores; mildly alkaline.

The A horizon and C horizon have hue of 5YR or 7.5YR, value of 4 to 6 dry and 4 or 5 moist, and chroma of 4 or 5. They range from loamy fine sand to fine sand. The soil is commonly noncalcareous, but is slightly calcareous in places.

PB—Pintura-Berino complex, eroded. This mapping unit is mainly in the central and eastern parts of the county. Slopes are 0 to 5 percent. The unit is about 50 percent Pintura soil, 40 percent Berino soil, and 10 percent Mohave soils, Simona soils, blowouts, and wind-shifted active sand dunes. The Berino soil is nearly level. The Pintura soil forms partly stabilized dunes or hummocks which are 24 to 96 inches high in generally nearly level to undulating areas.

Permeability is rapid in the Pintura soil and moderate in the Berino soil. The available water capacity is low in the Pintura soil and moderate in the Berino soil. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches or more.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Pintura soil in Sand Hills range site; Berino soil in Sandy range site.

PS—Pintura-Simona complex, eroded. This mapping unit is in the eastern part of the county. Slopes are 0 to 5 percent. The unit is 50 percent Pintura soil, 30 percent Simona soil, and 20 percent Berino, Mohave, and Bluepoint soils, blowouts, and wind-shifted active sand dunes. The Pintura soil forms stabilized dunes or sand hummocks, which are 24 to 72 inches high in nearly level to undulating areas. The Simona soil is between the hummocks and is nearly level.

Permeability is rapid in the Pintura soil and moderately rapid in the Simona soil. The available water capacity is very low in the Simona soil and low in the Pintura soil. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of about 60 inches in the Pintura soil and to a depth of 7 to 20 inches in the Simona soil.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Pintura soil in Sand Hills range site; Simona soil in Shallow range site.

Reeves Series

The Reeves series consists of moderately deep, well-drained soils that are high in content of gypsum. These soils formed in impure gypsum beds on uplands. Slopes are 0 to 3 percent. The vegetation is alkali sacaton, blue grama, annual grasses, and three-awn. Elevation ranges from 4,000 to 4,500 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is light-gray sandy loam about 2 inches thick. The upper 5 inches of the subsoil is light brownish-gray loam, and the lower 13 inches is white loam that is high in content of gypsum. The substratum is white fine powdery gypsum.

Reeves soils are used for livestock grazing and wildlife.

The Reeves soils in Luna County are mapped only with Cottonwood soils.

Representative profile of Reeves sandy loam in an area of Cottonwood and Reeves sandy loams, 100 feet west of ¼ corner between sec. 7 and 8, T. 28 S., R. 10 W.

A—0 to 2 inches, light-gray (10YR 7/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak, thin, platy structure; soft, very friable moist; many fine roots; many very fine interstitial pores and common fine vesicular pores; moderately calcareous; moderately alkaline; clear, abrupt boundary.

B21—2 to 7 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak, medium, subangular blocky structure; soft, very friable moist; common fine and very fine roots; many very fine interstitial pores; strongly calcareous; moderately alkaline; abrupt boundary.

B22cacs—7 to 20 inches, white (10YR 8/2) loam, pale brown (10YR 6/3) moist; massive; soft, very friable moist; few fine roots; common very fine interstitial pores and few fine tubular pores; few small pebbles; strongly calcareous; moderately alkaline; clear boundary.

Ccs—20 to 60 inches, white (10YR 8/2) fine powdery gypsum, very pale brown (10YR 7/3) moist; single grained; loose dry and moist; moderately calcareous; moderately alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 5 to 7 dry and 4 to 6 moist, and chroma of 2 to 4. It ranges from loam to sandy loam. The B horizon has hue of 7.5YR or 10YR, value of 6 to 8 dry and 4 to 8 moist, and chroma of 2 to 4. It ranges from loam to fine sandy loam. Depth to gypsum ranges from 20 to 30 inches.

Riverwash

RE—Riverwash occupies the nearly level channel bed of the Mimbres River. It consists mainly of several feet of loose sand stratified with gravel and silt. Texture and depth are variable, depending on the amount of material deposited or removed by each new flow of water. Slopes are 0 to 1 percent, and the soil material is covered by floodwater during periods of runoff. Cobbles and stones are numerous in some areas. Except for a few large shrubs, there is no vegetation. Small tracts of Arizo and Vinton soils are included in mapping.

Riverwash is used for watershed purposes. Local pools supply water for livestock and wildlife. Some tracts are a source for sand and gravel. Capability subclass VIIIw dryland; range site not assigned.

Rock Land

RO—Rock land is rolling to hilly. It is on low hills and the lower slopes of limestone mountains. Slopes are 10 to 25 percent. The soil material is mainly very shallow, gravelly, stony, or extremely stony loam. Large areas of limestone outcrop are exposed. The limestone is continuous, has only a few fractures, and in some areas has a one-half inch deposit of calcium carbonate. It makes up 50 to 60 percent of mapped areas, large boulders make up 20 to 40 percent, and gravelly to stony, shallow to deep loamy soils make up 10 to 20 percent (fig. 9). Included in mapping are small areas of Lehmans and Lozier soils.

The vegetation is sotol, black grama, side-oats grama, and blue grama. Elevation ranges from 5,000 to 8,408 feet. The mean annual precipitation is 8 to 13 inches, the mean annual air temperature is about 54° to 62° F, and the frost-free season is 150 to 200 days.

Runoff is very rapid. The hazard of water erosion is moderate.

Rock land is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Limestone Hills range site.

Rough Broken and Rock Land

RU—Rough broken and rock land is hilly to very steep. It is on hills and in mountainous areas throughout the county. Slopes are 25 to 75 percent. The soil material is very shallow to shallow over bedrock. In the lower areas, a thin mantle of soil supports a fair stand of vegetation. Bare rock exposures are dominant in the higher, steeper areas. These are acid and basic igneous outcrops or limestone. In Luna County, stones and boulders dominate the surface. Included in mapping are areas of Akela, Graham, Lehmans, and Lozier soils and numerous very small pockets of deep, stony and extremely stony loam.

The vegetation is black grama, side-oats grama, blue grama, and hairy grama. Scattered shrub live oak, pinyon pine, one-seed juniper, and Rocky Mountain juniper are at higher elevations. The lower areas are accessible to livestock. Elevation ranges from 4,800 to 8,400 feet. The mean annual precipitation is 8 to 14 inches, the mean annual air temperature is about 50° to 62° F, and the frost-free season is 150 to 210 days.

Runoff is very rapid. The hazard of water erosion is moderate to severe.

Rough broken and rock land has esthetic value and is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Hills range site.

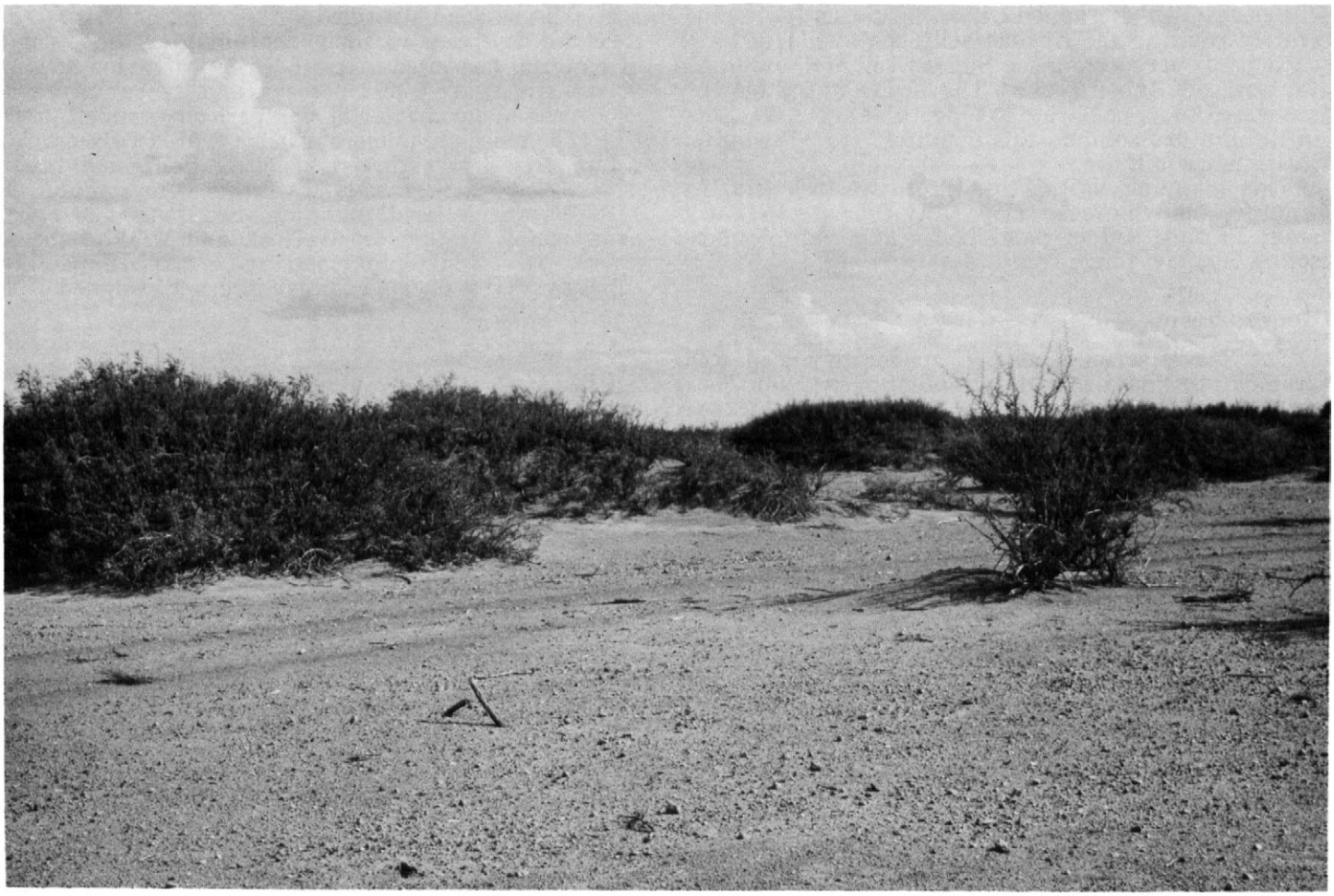

Figure 9.—**Soil material in this area of Rock land is completely covered with stones.**

Simona Series

The Simona series consists of very shallow to shallow, well-drained soils. These soils formed in mixed old alluvial sediments and sandy deposits that have been reworked by wind. Slopes are 0 to 5 percent. The vegetation is fluffgrass, dropseed, winterfat, and annuals. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is brown loamy sand about 6 inches thick. The subsoil is brown light sandy loam about 12 inches thick and contains nodules and fragments of hard caliche. The substratum is fractured or nodular indurated caliche.

Simona soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Simona loamy sand, 0 to 5 percent slopes, 1,320 feet north of southeast corner of sec. 19, T. 25 S., R. 5 W.

A1—0 to 6 inches, brown (7.5YR 5/4) loamy sand, dark brown (7.5YR 4/4) moist; single grained; loose dry and moist; common fine roots and few medium roots; few very fine interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

B2—6 to 18 inches, brown (7.5YR 5/4) light sandy loam, dark brown (7.5YR 4/4) moist; weak, medium, subangular blocky structure; soft, very friable moist; common fine and very fine roots; common fine interstitial pores; common medium-size nodules and fragments of hardened caliche; strongly calcareous; moderately alkaline; abrupt, wavy boundary.

IIC2cam—18 to 24 inches, white (N 8/0) indurated caliche, ½-inch laminar layer at the top.

The A horizon and B horizon have hue of 7.5YR or 10YR, value of 4 to 6 dry and 3 to 5 moist, and chroma of 3 or 4. The indurated caliche is at a depth of 7 to 20 inches.

SD—Simona loamy sand, 0 to 5 percent slopes. This nearly level to undulating soil is in the eastern part of the county. Included in mapping are areas of Berino, Pintura, and Bluepoint soils.

Permeability is moderately rapid, and the available water capacity is very low. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of 7 to 20 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Shallow range site.

Sonoita Series

The Sonoita series consists of deep, well-drained soils. These soils formed in alluvium derived mainly from granitic rock. Slopes are 1 to 3 percent. The vegetation is yucca, mesquite, mesa dropseed, black grama, bush muhly, and annuals. Elevation ranges from 4,200 to 5,700 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is yellowish-brown gravelly sandy loam and brown sandy loam about 8 inches thick. The subsoil is brown heavy sandy loam about 34 inches thick. It has an accumulation of lime in the lower part. Depth to the lime is about 30 inches. The substratum is brown fine gravelly sandy loam to a depth of 60 inches or more.

Sonoita soils are used for irrigated crops, livestock grazing, wildlife, and watershed.

Representative profile of Sonoita gravelly sandy loam, center of east side of sec. 17, T. 25 S., R. 8 W.

A11—0 to 3 inches, yellowish-brown (10YR 5/4) gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak, thin, platy structure; soft, very friable moist; few fine and medium large roots; common fine and medium interstitial pores; mildly alkaline; abrupt, smooth boundary.

A12—3 to 8 inches, brown (7.5YR 5/4) sandy loam, dark reddish brown (5YR 3/4) moist; weak, medium, subangular blocky structure; soft, very friable moist; common fine and medium roots; many very fine interstitial pores and few medium tubular pores; mildly alkaline; clear, smooth boundary.

B21t—8 to 30 inches, brown (7.5YR 5/4) heavy sandy loam, reddish brown (5YR 4/4) moist, weak, coarse, subangular blocky structure; soft, very friable moist, slightly sticky wet; common fine and medium roots; common very fine interstitial pores and few fine and medium tubular pores; few thin clay films bridging sand grains; mildly alkaline; clear, smooth boundary.

B22tca—30 to 42 inches, brown (7.5YR 5/4) heavy sandy loam, dark brown (7.5YR 4/4) moist; very weak, coarse, subangular blocky structure; slightly hard, friable moist, slightly sticky wet; few fine roots; many fine interstitial and tubular pores; few clay films bridging sand grains; moderately calcareous, lime disseminated and some visible lime in seams; moderately alkaline; clear, smooth boundary.

C—42 to 60 inches, brown (7.5YR 5/4) fine gravelly sandy loam, reddish brown (5YR 4/4) moist; single grained; loose dry and moist; common fine and medium tubular pores; 35 percent fine gravel; moderately calcareous; moderately alkaline.

The A horizon has hue of 5YR to 10YR, value of 5 or 6 dry, and chroma of 3 or 4. The B horizon has hue of 5YR or 7.5YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4. It ranges from heavy sand loam to sandy clay loam. The C horizon has hue of 5YR to 10YR, value of 5 or 6 dry and 3 or 4 moist, and chroma of 3 or 4. It is commonly fine gravelly sandy loam that is 20 to 35 percent fine gravel, but ranges to loamy sand or sand. The lime zone is within a depth of 30 to 48 inches.

Sn, SO—Sonoita gravelly sandy loam. This nearly level to gently undulating soil is on alluvial fans, mainly around the base of hills and mountains. It has the profile described as representative of the series. Included in mapping are Mohave and Onite soils, which make up about 10 percent of the areas mapped at high intensity, and Mohave, Tres Hermanos, Onite, and Bluepoint soils, which make up about 20 percent of the areas mapped at low intensity.

Permeability and the available water capacity are moderate. Runoff is slow to medium. The hazards of water erosion and soil blowing are moderate. Roots penetrate to a depth of 60 inches.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IIe–2 irrigated; capability subclass VIIe dryland; Sandy range site.

Ss—Sonoita-Pintura complex, eroded. This mapping unit is along mountain foot slopes. Slopes are 1 to 3 percent. The mapping unit is about 50 percent Sonoita soil, 40 percent Pintura soil, and 10 percent Mohave and Bluepoint soils. The Pintura soil forms partly stabilized dunes or hummocks, which are 2 to 8 feet high in nearly level to gently undulating areas. The Sonoita soil is level and is between the hummocks.

Permeability is moderate in the Sonoita soil and is rapid in the Pintura soil. The available water capacity is moderate in the Sonoita soil and low in the Pintura soil. Runoff is slow. The hazard of water erosion is slight. The hazard of soil blowing is severe. Roots penetrate to a depth of 60 inches or more.

This mapping unit is used mainly for livestock grazing, wildlife, and watershed. A few areas are irrigated. Capability unit IVe–11 irrigated; capability subclass VIIe dryland; Sonoita soil in Sandy range site; Pintura soil in Sand Hills range site.

Stellar Series

The Stellar series consists of deep, well-drained soils. These soils formed in mixed materials on alluvial fans and flood plains. Slopes are 0 to 5 percent. The vegetation is tobosa, black grama, blue grama, vine-mesquite, yucca, and Mormontea. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is about 8 to 11 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is pale-brown silty clay loam 3 inches thick. The subsoil is reddish-brown clay and silty clay about 34 inches thick. The substratum is reddish-brown and light reddish-brown clay loam. It contains segregated and disseminated lime (fig. 10).

Stellar soils are used for irrigated crops, livestock grazing, wildlife, and watershed.

Representative profile of Stellar silty clay loam, 165 feet south of northeast corner of SE¼ sec. 7, T. 29 S., R. 10 W.

A1—0 to 3 inches, pale-brown (10YR 6/3) silty clay loam, dark brown (7.5YR 4/2) moist; moderate, medium, platy structure in upper ½ inch parting to weak, fine, subangular blocky; soft, very friable moist, slightly sticky and slightly plastic wet; common fine and very fine roots; many fine vesicular pores and few very fine interstitial pores; slightly calcareous, lime is disseminated; mildly alkaline; abrupt, smooth boundary.

B21t—3 to 15 inches, reddish-brown (5YR 4/3) silty clay, dark reddish brown (5YR 3/3) moist; moderate, medium, subangular blocky structure; very hard, very firm moist, very sticky and plastic wet; common fine and very fine roots; few fine common micro interstitial pores and few medium tubular pores; few thin patchy clay films on ped surfaces;

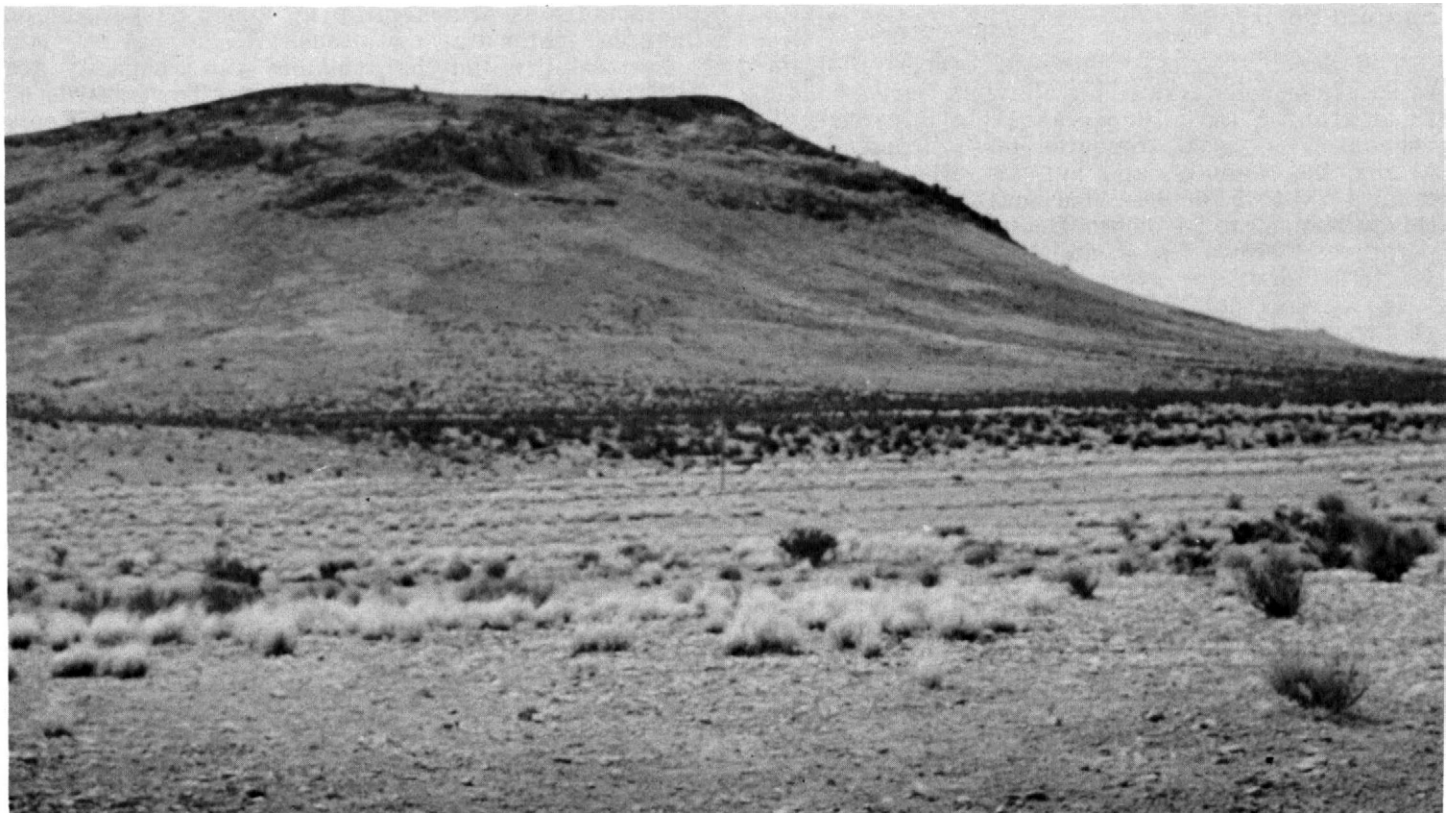

Figure 10.—**Landscape of Stellar silty clay loam. Lehmans extremely rocky loam, 10 to 25 percent slopes, in background.**

slightly calcareous, lime is disseminated; mildly alkaline; clear, wavy boundary.

B22t—15 to 23 inches, reddish-brown (5YR 4/3) silty clay, dark reddish brown (5YR 3/4) moist; weak, medium, subangular blocky structure; very hard, firm moist, very sticky and plastic wet; few fine and common very fine roots; common micro interstitial pores and few medium tubular pores; thick continuous clay films on ped surfaces and lining pores; moderately calcareous, lime is mainly disseminated with some lime mycelia; moderately alkaline; clear, smooth boundary.

B3—23 to 37 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/4) moist; weak, coarse, subangular blocky structure; hard, friable moist, very sticky and plastic wet; few fine roots; common micro interstitial pores and few fine and medium tubular pores; few thin patchy clay films on ped surfaces and in pores; moderately calcareous, common lime mycelia; moderately alkaline; clear, smooth boundary.

C1ca—37 to 44 inches, reddish-brown (5YR 4/4) clay loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable moist, sticky and plastic wet; few micro and fine interstitial pores; strongly calcareous, common soft lime masses and disseminated lime; moderately alkaline; gradual, smooth boundary.

C2ca—44 to 60 inches, light reddish-brown (5YR 6/4) clay loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable moist, sticky and plastic wet; few micro and fine interstitial pores; strongly calcareous, lime is segregated in soft lime masses; moderately alkaline.

The A horizon has hue of 5YR to 10YR, value of 4 to 6 dry and 4 or 5 moist, and chroma of 2 to 4. It ranges from sandy clay loam to silty clay loam. The B horizon has value of 4 or 5 dry and 3 or 4 moist. The C horizon has hue of 5YR to 7.5YR, value of 4 or 5 moist, and chroma of 2 to 4. It is commonly sandy clay loam or clay loam, but in places is as much as 20 percent gravel.

ST—Stellar sandy loam. This nearly level to undulating soil is mainly in the northwestern part of the county. It is on old alluvial fans and valley-fill slopes, generally above the valley floor. It has a profile similar to the one described as representative of the series, but the surface layer is 3 to 7 inches of sandy loam. Included in mapping are small areas of Bluepoint and Mohave soils. Also included are soils similar to this Stellar soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is about 55° to 57° F.

Permeability is slow, and the available water capacity is high. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches or more.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Sandy range site.

SU—Stellar silty clay loam. This level to nearly level soil is on scattered, old alluvial fans. Slopes are 0 to 3 percent. Included in mapping are small areas of Mohave and Mimbres soils. Also included are soils similar to this Stellar soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is about 55° to 57° F.

Permeability is slow, and the available water capac-

ity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches or more.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Clayey range site.

Sw—Stellar silty clay loam, 0 to 1 percent slopes. This level to nearly level soil is in the central part of the county on old alluvial fans and flood plains. It has the profile described as representative of the series. Included in mapping are small areas of Mohave and Mimbres soils. Also included are soils similar to this Stellar soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is about 55° to 57° F.

Permeability is slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches or more.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. Capability unit IIs–1 irrigated; capability subclass VIIs dryland; Clayey range site.

Stony Land

SX—Stony land is undulating to rolling and is mainly in the southwest part of the county. Slopes are 3 to 10 percent. The soil material, which is very gravelly or extremely stony, is 50 to 90 percent coarse fragments. Stones and boulders submerge soil characteristics, although in places the material is deep over bedrock (fig. 11). Included in mapping are small areas of moderately deep to deep stony loams and areas of Upton, Nickel, and Lehmans soils.

Runoff is medium to rapid. The hazard of water erosion is slight to moderate.

Stony land is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Hills range site.

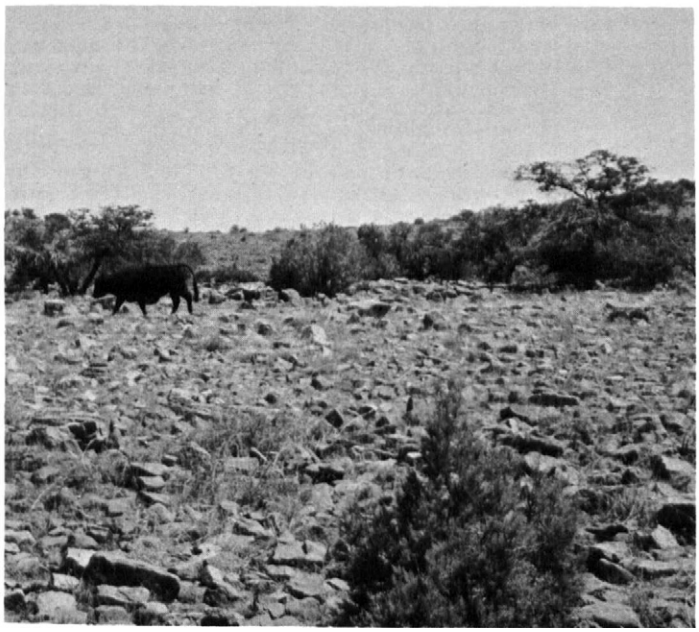

Figure 11.—Typical landscape of Stony land.

Tres Hermanos Series

The Tres Hermanos series consists of deep, well-drained soils. These soils formed in gravelly old alluvial fans derived from mixed igneous and sedimentary rocks around the base of hills and mountains. Slopes are 1 to 5 percent. The vegetation is creosotebush, American tarbush, black grama, and fluffgrass. Elevation ranges from 4,000 to 5,500 feet. The mean annual precipitation is 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is pinkish-gray gravelly loam about 3 inches thick. The subsoil is brown gravelly clay loam and gravelly heavy loam about 11 inches thick. The upper 22 inches of the substratum is light-brown gravelly clay loam and has lime-coated gravel. The lower part is very gravelly sandy clay loam to a depth of 60 inches and contains stones and cobbles. The soil is calcareous throughout.

Tres Hermanos soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Tres Hermanos gravelly loam, 1 to 5 percent slopes, 160 feet north and 100 feet east of southwest corner of sec. 2, T. 28 S., R. 13 W.

A1—0 to 3 inches, pinkish-gray (7.5YR 6/2) gravelly loam, brown (7.5YR 5/4) moist; strong, thin, platy structure; soft, very friable moist; common fine and few medium roots; many fine vesicular pores; moderately calcareous; mildly alkaline; abrupt, smooth boundary.

B21t—3 to 6 inches, brown (7.5YR 5/4) gravelly heavy loam, dark brown (7.5YR 4/4) moist; weak, medium, subangular blocky structure; slightly hard, very friable moist; common fine and few very fine roots; many fine and very fine interstitial pores and common fine tubular pores; few thin patchy clay films on peds and in pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

B22t—6 to 14 inches, brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; weak, medium, subangular blocky structure; hard, friable moist, slightly sticky and slightly plastic wet; common fine and very fine roots; many fine and very fine interstitial pores and few very fine tubular pores; few thin patchy clay films on vertical faces of peds and in pores; moderately calcareous, common fine lime mycelia; moderately alkaline; clear, smooth boundary.

C1ca—14 to 36 inches, light-brown (7.5YR 6/4) gravelly clay loam, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; hard, friable moist, slightly sticky and slightly plastic wet; few fine and very fine roots; many very fine interstitial pores and few fine tubular pores; strongly calcareous, patchy lime coatings on coarse fragments and common, medium, hard caliche fragments; moderately alkaline; abrupt, wavy boundary.

IIC2—36 to 60 inches, very gravelly sandy clay loam between lime-coated stones and cobbles, about 90 percent coarse fragments.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 dry and 4 or 5 moist, and chroma of 2 to 4. The B horizon has value of 5 or 6 dry and 4 or 5 moist and chroma of 3 or 4. The percent of lime increases with depth, and weakly cemented gravel, cobbles, and stones are at a depth of 20 to 36 inches. The B horizon is 15 to 35 percent gravel and the IIC horizon is 50 to 95 percent.

TH—Tres Hermanos gravelly loam, 1 to 5 percent slopes. This nearly level to undulating soil is on gravelly old alluvial fans around the base of hills and moun-

tains. It is in the southwestern part of the county. Included in mapping are small areas of Nickel, Upton, and Lehmans soils. Also included are soils similar to this Tres Hermanos soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is about 55° to 57° F.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 60 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Limy range site.

Turney Series

The Turney series consists of deep, well-drained soils. These soils formed in alluvium of mixed origin and are mainly around the Tres Hermanos Mountains. Slopes are 0 to 1 percent. The vegetation is creosotebush, black grama, mesquite, and fluffgrass. Elevation ranges from 3,800 to 4,500 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is pinkish-gray fine sandy loam 3 inches thick. The subsoil is light-brown heavy loam 23 inches thick. The substratum is pinkish-gray heavy loam and clay loam and is more than 40 percent calcium carbonate, which restricts roots. The soil is strongly calcareous throughout.

Turney soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Turney fine sandy loam in an area of Turney-Dona Ana association, ¼ mile west of southeast corner of sec. 29, T. 23 S., R. 6 W.

A1—0 to 3 inches, pinkish-gray (7.5YR 6/2) fine sandy loam, dark brown (7.5YR 4/2) moist; weak, thick, platy structure; soft, very friable moist; few fine roots; many fine interstitial pores and few fine vesicular pores; strongly calcareous; moderately alkaline; clear, smooth boundary.

B2—3 to 26 inches, light-brown (7.5YR 6/4) heavy loam, dark brown (7.5YR 4/4) moist; weak, fine, subangular blocky structure; soft, very friable moist; common fine roots and few very fine roots; common very fine interstitial pores and fine tubular pores; strongly calcareous; strongly alkaline; clear, wavy boundary.

C1ca—26 to 35 inches, pinkish-gray (7.5YR 7/2) heavy loam, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; soft, very friable moist; few very fine tubular pores; strongly calcareous, much visible disseminated soft lime; strongly alkaline; clear, smooth boundary.

C2ca—35 to 60 inches, pinkish-gray (7.5YR 7/2) clay loam, brown (7.5YR 5/4) moist; weak, fine, subangular blocky structure; slightly hard, friable moist, slightly sticky and slightly plastic wet; few very fine tubular pores; strongly calcareous, much visible disseminated soft lime that decreases with depth; strongly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 6 or 7 dry and 4 to 6 moist, and chroma of 2 to 4. It is commonly fine sandy loam but ranges from loam to loamy sand. The B horizon has value of 5 to 7 dry and 4 to 6 moist and chroma of 3 or 4. It is heavy loam to heavy sandy loam. The C horizon has hue of 7.5YR or 10YR and value of 6 or 7 dry and 5 or 6 moist. Strata of sand and gravel are below a depth of 35 inches in places. Depth to a zone that is more than 40 percent lime ranges from 20 to 40 inches.

TU—Turney-Dona Ana association. This level to nearly level mapping unit is on alluvial fans in the south-central part of the county. Slopes are 0 to 1 percent. The mapping unit is about 70 percent Turney fine sandy loam, 25 percent Dona Ana sandy loam, and 5 percent Mohave, Mimbres, and Hondale soils.

Permeability and the available water capacity are moderate. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

This mapping unit is used for livestock grazing, wildlife, and watershed. Capability subclass VIIe dryland; Turney soil in Limy range site; Dona Ana soil in Sandy range site.

Upton Series

The Upton series consists of very shallow and shallow, well-drained soils. These soils formed in gravelly old alluvium on fans derived from limestone, commonly around the base of hills and mountains. Slopes are 0 to 10 percent. The vegetation is creosotebush, winterfat, fluffgrass, mesa dropseed, bush muhly, and black grama. Elevation ranges from 4,000 to 5,500 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is about 57° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is pale-brown gravelly sandy loam about 6 inches thick. The substratum is very pale brown gravelly loam about 7 inches thick. It is strongly calcareous. White indurated caliche and gravel is at a depth of 13 inches.

Upton soils are used for livestock grazing, wildlife, and watershed.

Representative profile of Upton gravelly sandy loam, 3 to 10 percent slopes, south center of SE¼NE¼ of sec. 20, T. 27 S., R. 8 W., west of highway:

A1—0 to 6 inches, pale-brown (10YR 6/3) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak, medium, platy structure in the upper 2 inches parting to weak, fine, granular; soft, very friable moist; few fine roots; many fine and very fine interstitial pores and common fine vesicular pores; strongly calcareous, disseminated lime; moderately alkaline; clear, smooth boundary.

C1—6 to 13 inches, very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; massive; soft, very friable moist, slightly sticky wet; few fine roots; many fine and very fine interstitial pores; strongly calcareous, lime is disseminated and is patchy coatings on coarse fragments; moderately alkaline; abrupt, smooth boundary.

C2cam—13 inches, white (10YR 8/2) indurated caliche; laminar upper surface and embedded limestone and igneous gravel.

The A horizon and C1 horizon have hue of 7.5YR or 10YR, value of 5 to 7 dry and 3 to 5 moist, and chroma of 2 to 4. The content of coarse fragments in the A horizon and C1 horizon averages 15 to 35 percent. The C1 horizon is absent in many places. Depth to the Ccam horizon ranges from 4 to 20 inches.

UG—Upton gravelly sandy loam, 3 to 10 percent slopes. This gently undulating to rolling soil occurs throughout the county. It has the profile described as representative of the series. Included in mapping are small areas of Nickel, Simona, and Mohave soils. Also included are soils similar to this Upton soil in the

northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is 55° to 62° F. and annual precipitation is 10 to 14 inches.

Permeability is moderate, and the available water capacity is very low. Runoff is medium. The hazards of soil blowing and water erosion are moderate. Roots penetrate to a depth of 4 to 20 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Limy range site.

UP—Upton gravelly loam, 0 to 10 percent slopes. This nearly level to rolling soil is in scattered areas throughout the county. It has a profile similar to the one described as representative of the series, but the surface layer is about 6 inches of light brownish-gray gravelly loam. Included in mapping are small areas of Nickel soils and Upton soils that are free of gravel above the caliche. Also included are soils similar to this Upton soil in the northern part of the county at an elevation of as much as 6,000 feet, where the mean annual air temperature is 55° to 57° F, and annual precipitation is 10 to 14 inches.

Permeability is moderate, and the available water capacity is very low. Runoff is medium. The hazard of water erosion is moderate. Roots penetrate to a depth of 4 to 20 inches.

This soil is used for livestock grazing, wildlife, and watershed. Capability subclass VIIs dryland; Limy range site.

Verhalen Series

The Verhalen series consists of deep, moderately well drained soils. These soils formed in mixed alluvial sediments deposited on flood plains and alluvial fans. Slopes are 0 to 1 percent. The vegetation is tobosa, black grama, vine-mesquite, alkali sacaton, and mesquite. Elevation ranges from 3,800 to 5,000 feet. The mean annual precipitation is 8 to 11 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is brown silty clay loam about 5 inches thick. The substratum is reddish-brown and pinkish-gray silty clay and clay. Wide cracks form when the soil is dry. The soil is calcareous throughout.

Verhalen soils are used for irrigated crops, livestock grazing, and wildlife.

Representative profile of Verhalen silty clay loam, 600 feet east of northwest corner of NE¼ sec. 1, T. 28 S., R. 8 W.

A1—0 to 5 inches, brown (7.5YR 5/4) silty clay loam, dark brown (7.5YR 3/4) moist; weak, medium, platy structure; hard, firm moist, very sticky and very plastic wet; many fine roots; common fine tubular pores and many micro interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C1—5 to 17 inches, reddish-brown (5YR 5/3) silty clay, dark reddish brown (5YR 3/3) moist; weak, coarse, prismatic structure; hard, firm moist, very sticky and moderately plastic wet; many fine and very fine roots; few fine tubular pores and many micro interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C2—17 to 30 inches, reddish-brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; massive; very hard, very firm moist, very sticky and slightly plastic wet; many fine roots; many micro interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C3—30 to 60 inches, pinkish-gray (7.5YR 6/2) clay, dark reddish brown (5YR 3/3) moist; weak, fine, subangular blocky structure; very hard, firm moist, very sticky and very plastic wet; common fine roots; common micro interstitial pores; moderately calcareous; moderately alkaline; clear, smooth boundary.

C4—60 to 70 inches, pinkish-gray (7.5YR 6/2) silty clay, dark brown (7.5YR 4/4) moist; massive; hard, firm moist, very sticky and very plastic wet; common fine and micro interstitial pores; strongly calcareous; moderately alkaline.

The A horizon has hue of 5YR to 10YR, value of 4 or 5 dry and 2 or 3 moist, and chroma of 4 to 6. It is silty clay loam or silty clay. The C horizon has hue of 5YR to 10YR and value of 4 to 6 dry and 3 to 5 moist. In places gravelly sandy loam or sand is below a depth of 50 inches.

Ve—Verhalen silty clay loam. This level soil is on flood plains and alluvial fans, mainly on bottoms of wide drainage channels. Slopes are 0 to 1 percent. The soil has the profile described as representative of the series. Included in mapping are small areas of Mimbres soils and alkali-affected Verhalen soils.

Permeability is very slow, and the available water capacity is high. Runoff is slow. The hazard of water erosion is moderate. Roots penetrate to a depth of 60 inches or more. The soil cracks when dry.

This soil is used for irrigated crops, livestock grazing, and wildlife. Capability unit IIIs–1 irrigated; capability subclass VIIs dryland; Bottomland range site.

Vh—Verhalen silty clay loam, alkali. This level soil is on flood plains and alluvial fans, mainly on bottoms of drainage channels. Slopes are 0 to 1 percent. The soil has a profile similar to the one described as representative of the series, but it is moderately alkali affected. Included in mapping are small areas of alkali-affected Mimbres soils and areas of Verhalen soils that are not alkali affected.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow. The hazard of water erosion is moderate. Roots penetrate to a depth of 60 inches or more.

This soil is used for livestock grazing, irrigated crops, and wildlife. Capability unit IVs–11 irrigated; capability subclass VIIs dryland; Salty Bottomland range site.

Vinton Series

The Vinton series consists of deep, well-drained soils. These soils formed in recent sandy alluvial sediments along the Mimbres River. Slopes are 0 to 5 percent. The vegetation is mesa dropseed, giant dropseed, and annual weeds. Elevation ranges from 4,000 to 5,000 feet. The mean annual precipitation is about 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is light brownish-gray loamy sand about 48 inches thick. The substratum is pale-brown very gravelly sand to a depth of 60 inches or more. The soil is slightly calcareous throughout.

Permeability is moderately rapid, and the available water capacity is low. Roots penetrate to a depth of 60 inches.

Vinton soils are used for livestock grazing and wildlife. They are subject to rare overflow.

The Vinton soils in Luna County are mapped only with Arizo soils.

Representative profile of Vinton loamy sand in an area of Arizo and Vinton soils, 3 miles northwest of Deming in center of N½SW¼ sec. 19, T. 23 S., R. 9 W.

AC—0 to 48 inches, light brownish-gray (10YR 6/2) loamy sand, dark brown (10YR 4/3) moist; single grained; loose dry and moist; common fine and very fine roots, few medium roots; many very fine interstitial pores; a few thin strata of fine sandy loam; slightly calcareous; mildly alkaline; abrupt, smooth boundary.

IIC—48 to 60 inches, pale-brown (10YR 6/3) very gravelly sand, dark brown (10YR 4/3) moist; single grained; loose dry and moist; 70 percent gravel; slightly calcareous; mildly alkaline.

The A horizon and C horizon have hue of 7.5YR or 10YR, value of 5 or 6 dry and 4 or 5 moist, and chroma of 2 to 4. They are loamy sand to fine sand. Depth to very gravelly material is 40 inches or more.

Yturbide Series

The Yturbide series consists of deep, excessively drained soils. These soils formed in recent sandy alluvium of streams and washes. They have been modified by wind action. Slopes are 0 to 3 percent. The vegetation is mesa dropseed, giant dropseed, and fluffgrass. Elevation ranges from 4,000 to 4,500 feet. The mean annual precipitation is 8 to 10 inches, the mean annual air temperature is 58° to 62° F, and the frost-free season is 180 to 210 days.

In a representative profile the surface layer is brown loamy sand about 2 inches thick. The upper part of the substratum is brown loamy sand about 14 inches thick. The lower part is brown gravelly sand to a depth of 60 inches.

Yturbide soils are used for irrigated crops, livestock grazing, and wildlife.

Representative profile of Yturbide loamy sand, 400 feet northwest of center of sec. 7, T. 25 S., R. 6 W.

A1—0 to 2 inches, brown (10YR 5/3) loamy sand, dark yellowish brown (10YR 4/4) moist; weak, thin, platy structure; soft, very friable moist; few fine and medium roots; common fine interstitial pores; mildly alkaline; abrupt, smooth boundary.

C1—2 to 16 inches, brown (7.5YR 5/4) loamy sand, dark brown (7.5YR 4/4) moist; weak, coarse, subangular blocky structure; soft, very friable moist; few fine and medium roots; common fine interstitial pores; mildly alkaline; clear, smooth boundary.

IIC2—16 to 60 inches, brown (10YR 5/3) gravelly sand, dark yellowish brown (10YR 4/4) moist; single grained; loose dry and moist; few fine roots to a depth of 24 inches; common fine interstitial pores; 20 percent gravel; slightly calcareous; mildly alkaline.

The A horizon and C horizon have value of 5 or 6 dry and 4 or 5 moist. They are commonly loamy sand, but in places have a few strata of sand or sand and gravel. The content of gravel in the IIC horizon ranges from 15 to 35 percent.

Yt—Yturbide loamy sand. This nearly level to gently undulating soil is on very slight ridges in the central part of the county. Included in mapping are small areas of Bluepoint, Maricopa, and Harkey soils.

Permeability is rapid, and the available water capacity is low. Runoff is slow. The hazard of soil blowing is severe. Roots penetrate to a depth of about 60 inches.

This soil is used for irrigated crops, livestock grazing, and wildlife. Capability unit IVe–11 irrigated; capability subclass VIIe dryland; Deep Sand range site.

Use and Management of the Soils

This part of the survey suggests the management needed for irrigated crops of Luna County. It also explains the capability classification. Table 2 lists estimated average yields per acre of selected crops. Also in this part of the survey is information on range sites, windbreaks, wildlife, and engineering.

General Management of Irrigated Soils

The management needed in Luna County protects the soil from erosion, maintains tilth, and supplies plant nutrients for long-term, high-level production.

The cultivated areas of Luna County are in a semidesert region. All tilled crops are irrigated because rainfall is inadequate. The irrigated areas are mainly in the central, northeastern, and south-central parts of the county.

The main objectives in management are increasing or maintaining crop production and reducing the risk of erosion. To be considered are cover crops and grasses or legumes, or both, in a long-term rotation; management of crop residue; minimum tillage; fertilization; management of irrigation water; and treatment of special problems, such as excess alkali (figs. 12 and 13).

The most effective way to meet management goals is to select the right management combinations. The management needed depends on the needs of the soil.

Cropping systems

A soil-conserving cropping system improves or maintains tilth; controls erosion; controls weeds, insects, and diseases; and meets economic needs. It is a rotation or sequence in which soil-improving crops balance the effects of soil-depleting crops.

How often a soil-improving crop is grown depends on the severity of the erosion hazard and other limitations. A soil-improving crop is needed less frequently on a deep, medium-textured soil, such as Harkey silt loam than on a deep, coarse-textured soil, such as Bluepoint loamy sand, 0 to 3 percent slopes. Legumes, such as alfalfa, and grasses improve the soil if they are well managed and fertilized and a large amount of plant growth is returned to the soil during the last year of a rotation.

Nonlegumes, such as small grains and sorghum, are satisfactory if large quantities of residue are returned to the soil, nitrogen is applied to aid in decomposition, and large amounts of the residue are mixed with the soils as a green manure.

Cover crops protect and improve the soil between periods of regular crop production. Suitable cover

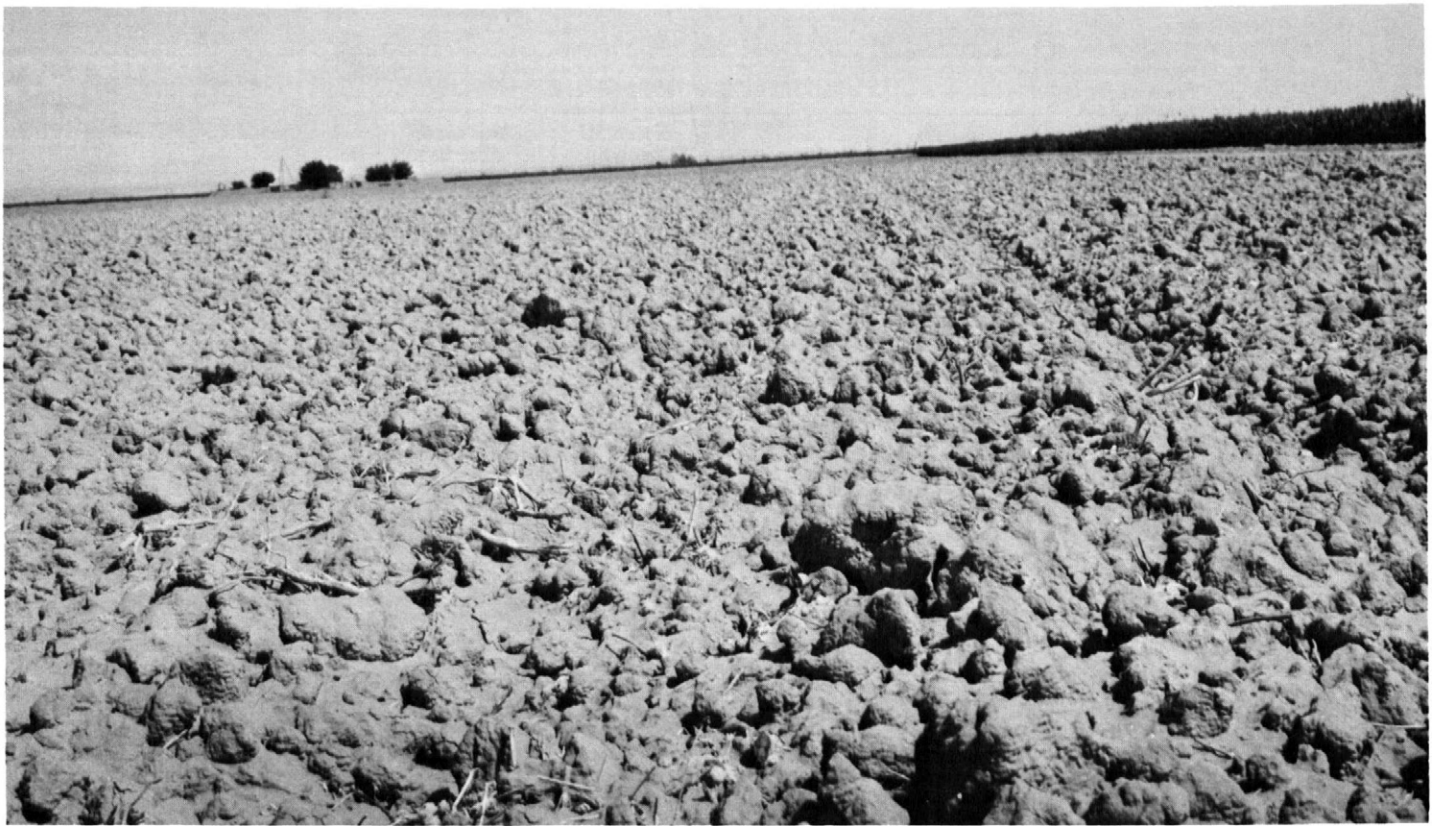

Figure 12.—**Clods on Mimbres silty clay loam, alkali, become very hard when dry.**

crops are small grain, vetch, winter peas, and sweet clover.

Some soils in Luna County are infested with verticillium wilt, a soil-borne fungus that mainly affects cotton. Verticillium wilt is most prevalent on slowly to very slowly permeable soils, such as Hondale loam or Verhalen silty clay loam. It occurs on all soils if cotton is grown continuously for a few years. It can be controlled if cotton is frequently rotated with a high-residue crop, such as barley or grain sorghum.

Among the important irrigated crops suited to the soil and climate of Luna County are cotton, sorghum, barley, pinto beans, alfalfa, and truck crops.

Crop residue

Conserving crop residue by working it into the surface is a desirable practice on all irrigated soils in Luna County. Crop residue contains parts of the nutrients that growing plants removed from the soil. When residue is returned to the soil, it is digested by microorganisms and humus is formed. This practice returns some of the nutrients removed by the crop, but more importantly it supplies nutrients for bacterial activity.

Some beneficial effects that result from returning crop residue to the soil are improved tilth, increased infiltration rate, reduced erosion, improved environment for bacterial life, increased soil pore space for more air and water, and reduced surface crusting.

Unless well managed, such soils as Gila sandy loam and Maricopa sandy loam are susceptible to wind erosion in spring. On these soils the residue from grain sorghum, for example, should not be plowed under immediately following harvest, but maintained on the surface until the seedbed is prepared.

Minimum tillage

Minimum tillage is needed in Luna County. If soils are cropped, they must be worked into a seedbed, and weeds or other competitive vegetation must be controlled. Excessive tillage breaks down soil structure. Soil particles are compacted, thus reducing pore space. The soil then tends to puddle and crust at the surface. It takes in less water and air and at a slower rate. Mimbres silty clay loam is a good example. Excessive tillage also causes surface soil compaction, particularly on soils that have a surface layer of loam, silt loam, or silty clay loam. Compaction can be avoided by reducing the amount of fieldwork, by not tilling when the soil is wet, and by varying the depth of tillage to reduce the occurrence of a plowpan.

Fertilization

Good management of irrigated crops requires the use of commercial fertilizer or the application of barnyard manure, or both. Plants need nutrients if they are to produce high yields and large quantities of residue, which improves or maintains tilth and helps to control erosion.

Most soils in Luna County are deficient in nitrogen

Figure 13.—**Tilth can be improved on Mimbres silty clay loam, alkali, by incorporating crop residue.**

and available phosphorus. Potash is generally available in sufficient quantities.

The amount and kind of fertilizer to be applied should be based mainly on the kind of soil, on plant needs, on previous cropping history, and on laboratory soil tests or plant tissue tests.

Some soils in Luna County are deficient in available iron, zinc, and other trace elements, particularly soils that are high in content of lime, such as Jal fine sandy loam or Dona Ana sandy clay loam. A low supply of available iron is normally evidenced by the yellowing of plant leaves, known as iron chlorosis. It shows particularly on grain sorghum, garden crops, lawns, and fruit trees. Lime-induced chlorosis can be controlled by using iron chelates or inorganic compounds, such as ferrous sulfate.

Barnyard manure provides needed plant nutrients and also improves tilth. Areas from which part or all of the topsoil has been removed through leveling should receive heavy applications of barnyard manure. Otherwise, they should be well fertilized and planted to a soil-improving crop.

Water management

Irrigation water should be managed efficiently and according to moisture needs of the crop. Efficient management achieves optimum production, conserves water, eliminating excessive percolation and minimizing runoff, and minimizes loss of soil and plant nutrients. The quantity of irrigation water needed is determined by the available water capacity of the soil and the requirements of the crop grown.

Alkali soils

In alkali soils the content of exchangeable sodium is 15 percent or more. Such soils are generally strongly alkaline or very strongly alkaline (pH of 8.5 or more). About 239,600 acres in Luna County is alkali affected. About 31,400 acres of alkali-affected soils is cropped. This acreage is in the high intensity part of the surveyed area.

Alkali soils are somewhat limited, but are suitable for cultivation if irrigated. Hondale, Mimbres, and Verhalen soils are examples. In a moderately alkali-

affected soil the sodium is sufficient to affect tilth and plant growth. Alkali soils are often slick, puddled, and glazed. Stands are spotty, and growth patterns are stunted and irregular.

Beans, pecans, and fruit trees are sensitive to sodium. Alfalfa, cotton, and barley are sodium-tolerant. Spotty stands and the irregular growth of sodium-tolerant crops are caused mainly by poor tilth and the moisture-air-soil relationship, not by the alkali condition (*7*).

Adding chemical amendments, such as gypsum, sulfur, or sulfuric acid, and then leaching, or flushing the soil with irrigation water, improves the tilth of a moderately alkali-affected soil. Amendments should not be applied unless water is adequate and subsurface drainage permits removal of salts by leaching. As the water passes through the soil the soluble salts are moved away from the root zone.

It is desirable to follow gypsum and leaching treatment of alkali soils with an application of barnyard manure and seeding of drilled, fibrous-rooted crops, such as adapted small grain or grasses. Tall wheatgrass has abundant deep fibrous roots, which add organic matter and improve soil segregation and general soil condition. No crop should be planted unless the sodium content can be reduced to a desirable level.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or engineering.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These levels are defined in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife. (None in Luna County.)

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture or range, woodland, or wildlife. (None in Luna County.)

Class VII soils have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–2 or IIIe–11. Thus in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

On the following pages the capability units of irrigated soils in Luna County are described and the use and management is suggested. The names of soil series represented are named in the description of the capability unit, but this does not mean that all the soils of a given series appear in that unit. Suggestions on use and management of dryland soils can be found in the appropriate range site description. The Guide to Mapping Units at the back of this survey lists the capability unit for each soil mapped in the county.

CAPABILITY UNIT I-1 IRRIGATED

This unit consists of deep, well-drained Gila, Harkey, Mimbres, and Mohave soils. For the most part, these soils have a medium-textured surface layer and a medium to moderately fine textured underlying layer. The Mohave soil has a sandy clay loam surface layer. Some of the Mimbres soils have a silty clay loam surface layer.

Soils in this unit formed in mixed alluvium on flood plains and fans. Slopes are 0 to 1 percent. The mean annual precipitation is about 8 to 11 inches, and the frost-free season is 170 to 210 days. Permeability is moderate to moderately slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches.

These soils are used for such irrigated crops as grain sorghum, alfalfa, pinto beans, and tomatoes.

Using irrigation water efficiently and maintaining fertility are essential. A crop that leaves large amounts of residue should be grown 1 year in 4. Otherwise, the soil should be mulched with suitable residue or a cover crop grown, for example, a deep-rooted legume or perennial grass. Barnyard manure or commercial fertilizer is needed. A well designed irrigation system is essential. Both gravity and sprinkler irrigation are suitable. Delaying tillage until the soil is sufficiently dry to prevent a tillage pan is essential on the Mimbres silty clay loam.

CAPABILITY UNIT IIe-2 IRRIGATED

This unit consists of deep, well-drained Dona Ana, Gila, Harkey, Mohave, and Sonoita soils. These soils have a moderately coarse textured to medium textured surface layer and moderately fine textured to moderately coarse textured underlying layers.

Soils in this unit formed in old and recent alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is 8 to 11 inches, and the frost-free season is 170 to 210 days. Permeability is moderate to moderately slow. Runoff is slow to medium, and the available water capacity is high. The hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

These soils are used for irrigated crops, livestock grazing, wildlife, and watershed. The main crops are cotton, barley, grain sorghum, and alfalfa.

Controlling soil blowing, using irrigation water efficiently, and maintaining fertility are essential in management. A high-residue or a soil-building crop should be grown 1 year in 3. Otherwise, the soil should be mulched with a suitable residue or a cover crop grown. A deep-rooted legume or perennial grass in a long-term rotation helps to control erosion and keeps the soil in good tilth. Barnyard manure or commercial fertilizer is needed. A well designed irrigation system is essential. Both gravity and sprinkler irrigation are suitable. Hummocky areas must be smoothed before they are used for irrigated crops.

CAPABILITY UNIT IIs-1 IRRIGATED

Stellar silty clay loam, 0 to 1 percent slopes, the only soil in this unit, is deep and well drained. It has a fine-textured subsoil.

This soil formed on fans in old alluvium derived from mixed sources. The mean annual precipitation is about 8 to 11 inches, and the frost-free season is 180 to 210 days. Permeability is slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches or more.

This soil is used for irrigated crops, livestock grazing, wildlife, and watershed. The main crops are cotton, sorghum, alfalfa, barley, and tomatoes.

Maintaining tilth and fertility and using irrigation water efficiently are essential. The surface layer is easily compacted when wet, and tillage must be properly timed to prevent clodding and the formation of a tillage pan. A high-residue or soil-improving crop should be grown 1 year in 3. Otherwise, the soil should be mulched with a suitable residue or a cover crop grown. A deep-rooted legume or perennial grass in a long-term rotation controls erosion and keeps the soil in good tilth. Barnyard manure or commercial fertilizer or both are needed. A well designed gravity irrigation system is best suited. Chemicals and mechanical measures are needed to control weeds, insects, and plant diseases.

CAPABILITY UNIT IIs-4 IRRIGATED

This unit consists of deep, well-drained Dona Ana soils and Mimbres variant. These soils have a moderately fine textured surface layer and a moderately fine textured, strongly calcareous subsoil.

Soils in this unit formed in mixed old alluvium and sandy wind-laid deposits. Slopes are 0 to 3 percent. The mean annual precipitation is 8 to 10 inches, and the frost-free season is 170 to 210 days. Permeability is moderate to moderately slow, and the available water capacity is moderate. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

These soils are used for such irrigated crops as cotton, barley, grain sorghum, alfalfa, beans, and tomatoes.

Controlling soil blowing, using irrigation water efficiently, and maintaining fertility are essential in management. The soil becomes cloddy when worked and is difficult to keep in good tilth. A high-residue or soil-building crop should be grown 1 year in 3. Otherwise, the soil should be mulched with suitable residue or a cover crop grown. A deep-rooted legume or perennial grass in a long-term rotation helps to control soil blowing and keeps the soil in good tilth. Barnyard manure or commercial fertilizer is needed. Lime-induced chlorosis is a common concern. Deep cuts should be avoided in leveling because the subsoil is high in content of lime or is a sandy layer. A well designed irrigation system is essential.

CAPABILITY UNIT IIIe-11 IRRIGATED

This unit consists of deep, well drained to somewhat excessively drained Bluepoint and Maricopa soils. These soils have a moderately coarse textured to coarse textured surface layer and moderately coarse textured or coarse textured underlying layers.

Soils in this unit formed in sandy alluvium on fans and flood plains. Slopes are 0 to 3 percent. The average annual precipitation is 8 to 11 inches, and the frost-free season is 180 to 210 days. Permeability is moderately rapid to rapid, and the available water capacity

is low. Runoff is slow. The hazard of soil blowing is severe unless plant cover is maintained. Roots penetrate to a depth of 60 inches or more.

These soils are used mainly for irrigated crops, livestock grazing, and wildlife. They are best suited to alfalfa, cotton, and grain sorghum.

A soil-building or high-residue crop should be planted every other year to maintain the level of organic matter and reduce the hazard of soil blowing. Regular applications of fertilizer are needed. An efficient irrigation system and good water management are needed. Hummocky areas must be smoothed before they are used for irrigated crops. Crop residue on the surface during the windy season helps control soil blowing. Chemicals and tillage practices are needed to control weeds, insects, and plant diseases.

CAPABILITY UNIT IIIs–1 IRRIGATED

Verhalen silty clay loam, the only soil in this unit, is a deep, moderately well drained soil. It has fine-textured underlying layers.

This soil formed in clayey alluvium on flood plains. Slopes are 0 to 1 percent. The mean annual rainfall is about 8 to 11 inches, and the frost-free season is 180 to 210 days. Permeability is very slow, and the available water capacity is high. Runoff is slow. The hazard of erosion is moderate. Roots penetrate to a depth of 60 inches or more.

This soil is used for irrigated cotton, grain sorghum, alfalfa, and barley. It becomes cloddy when worked and is difficult to keep in good tilth. It cracks when dry and seals over when wet. Timely tillage is needed to prevent clodding. A soil-building or high-residue crop for half the rotation improves water intake and maintains the level of organic matter. Barnyard manure or commercial fertilizer is needed. An efficient irrigation system and good water management are essential. Gravity irrigation is best suited. Mechanical and chemical measures are needed to control weeds, pests, and plant diseases.

CAPABILITY UNIT IIIs–7 IRRIGATED

This unit consists of well-drained Jal and Karro soils. These soils have a moderately coarse textured or moderately fine textured surface layer and underlying layers. They are shallow to moderately deep over hard caliche or a strong lime zone.

These soils formed in mixed material on old alluvial fans on uplands or old beachlines. Slopes are 0 to 3 percent. The mean annual precipitation is 8 to 10 inches, and the frost-free season is 180 to 210 days. Permeability is moderate or moderately slow, and the available water capacity is low. Runoff is slow. The hazard of soil blowing is moderate. Roots penetrate to a depth of 60 inches.

These soils are used mainly for livestock grazing, wildlife, and watershed. Small areas are cultivated, but the soils are droughty and are better suited to permanent pasture. Crop residue returned to the soil maintains fertility and the level of organic matter and improves tilth and the available water capacity. A high-residue or soil-improving crop should be grown 3 years in 4. Close-growing legumes or perennial grass in a long-term cropping system keeps the soils in good tilth. All crops respond to commercial fertilizer. Some crops, especially sorghums, are subject to iron chlorosis because the content of lime is high. An efficient irrigation system and good water management are needed for optimum production. Surface systems require smoothing. Deep cuts should be avoided so that the high lime layer is not exposed. Mechanical and chemical measures are needed to control annual and perennial weeds.

CAPABILITY UNIT IVe–11 IRRIGATED

This unit consists of well-drained to excessively drained Dona Ana, Mohave, Pintura, Sonoita, and Yturbide soils. These soils are coarse textured throughout or are intermingled with coarse textured soils.

Soils in this unit formed in sandy alluvium modified by wind. Slopes are 0 to 3 percent. The mean annual precipitation is 8 to 10 inches, and the frost-free season is 180 to 210 days. Permeability is moderate to rapid, and the available water capacity is low to high. Runoff is slow. The hazard of soil blowing is severe unless plant cover is maintained. Roots penetrate to a depth of 60 inches or more.

These soils are used mainly for livestock grazing and wildlife. They are suited to alfalfa and grain sorghum.

Soil blowing can be reduced by planting a soil-improving crop at least 2 years in 3. Crop residue returned to the soil maintains tilth and the level of organic matter and reduces soil blowing. All crops respond to commercial fertilizer. An efficient irrigation system and good water management are needed. Applications of water should be light and frequent and irrigation ditches should be lined to prevent seepage. Leveling and smoothing are needed for surface irrigation, but deep cuts in leveling should be avoided. Mechanical and chemical measures are needed to control annual and perennial weeds.

CAPABILITY UNIT IVs–10 IRRIGATED

Mimbres silty clay loam, alkali, the only soil in this unit, is well drained. It has a moderately fine textured subsoil.

This soil formed in mixed alluvium on alluvial fans and terraces. Slopes are 0 to 1 percent. The mean annual precipitation is about 8 to 11 inches, and the frost-free season is 170 to 210 days. Permeability is slow, and the available water capacity is moderate. Water infiltration is slow or very slow as a result of soil dispersion by the alkali. Runoff is slow. The hazard of erosion is slight. Roots penetrate to a depth of 60 inches or more.

This soil is used for livestock grazing, wildlife, and irrigated crops. The main crops are cotton, barley, grain sorghum, alfalfa, and perennial grasses.

Using irrigation water efficiently, increasing fertility, and reducing alkali are essential in management. Leaching alkali is difficult because drainage outlets are lacking. A high-residue or soil-improving crop should be grown every 2 years. Otherwise, a cover crop of green manure should be grown. A deep-rooted legume, such as alfalfa or perennial grass, in a long-term rotation keeps the soil in good tilth. Barnyard manure or commercial fertilizer is needed. A well designed irrigation system is needed. Gravity irrigation is best

TABLE 2.—*Estimated average yields per acre of selected crops*

[Yields are those expected under optimum management. Absence of yield indicates the crop is not commonly grown on the soil. Only the soils used to a significant extent for the specified crops are listed]

Soil	Cotton lint	Barley	Grain sorghum	Alfalfa	Pinto beans	Tomatoes
	Lb	*Bu*	*Lb*	*Tons*	*Lb*	*Tons*
Bluepoint loamy sand, 0 to 3 percent slopes	1,000		5,000	7		
Dona Ana sandy clay loam	1,500	85	7,000	8	1,500	
Dona Ana sandy loam	1,300	90	6,500	7		
Gila loam	1,400	105	8,000	9	2,400	
Gila sandy loam	1,300	90	6,500	7	2,000	
Harkey sandy loam	1,300	90	6,500	7		
Harkey silt loam	1,500	100	7,500	9	2,000	19
Hondale loam	900	60	4,500	6		
Jal fine sandy loam	900	65	4,500	6		
Karro silty clay loam	950	70	5,000	6	1,200	21
Maricopa sandy loam	1,250	60	5,500	7		
Mimbres loam	1,600	100	7,000	10	2,500	24
Mimbres silty clay loam	1,650	100	7,500	9	2,500	24
Mimbres silty clay loam, alkali	1,100	45	5,000	6		
Mimbres silty clay loam, sandy subsoil variant	1,400	95	6,700	8		
Mohave sandy clay loam, 0 to 1 percent slopes	1,400	110	7,000	9	2,000	22
Mohave sandy loam, 0 to 1 percent slopes	1,300	90	6,500	7		
Sonoita gravelly sandy loam	1,250	85	6,300	7		
Stellar silty clay loam, 0 to 1 percent slopes	1,400	60	6,000	8		17
Verhalen silty clay loam	1,400	80	5,600	7		
Verhalen silty clay loam, alkali	850	65	4,500	5		
Yturbide loamy sand	900		4,000	5		

suited. Mechanical and chemical measures are needed to control annual and perennial weeds.

CAPABILITY UNIT IVs–11 IRRIGATED

This unit consists of moderately well drained to well drained, alkali-affected Hondale and Verhalen soils. These soils have a medium textured to moderately fine textured surface layer and fine-textured underlying layers.

Soils in this unit formed on broad alluvial flats or bottoms in valley-fill sediments and fine-textured alluvium derived from mixed sources. Slopes are 0 to 1 percent. The mean annual precipitation is 8 to 11 inches, and the frost-free season is 180 to 210 days. Permeability is very slow, and the available water capacity is moderate. Water infiltration is very slow as a result of soil dispersion by the alkali. Runoff is slow. The hazard of erosion is slight to moderate. Roots penetrate to a depth of about 60 inches.

These soils are used for livestock grazing, wildlife, and irrigated crops. The main crops are cotton, barley, grain sorghum, alfalfa, and perennial grasses.

Using irrigation water efficiently, increasing fertility, and reducing alkali are essential. Leaching alkali is difficult because drainage outlets are lacking. A high-residue or soil-improving crop should be grown every year. Otherwise, a cover crop of green manure should be grown. A deep-rooted legume, such as alfalfa or perennial grass, in a long-term rotation keeps the soil in good tilth. Barnyard manure or commercial fertilizer is needed. A well designed irrigation system is essential. The soils are best suited to gravity irrigation. Mechanical and chemical measures are needed to control annual and perennial weeds.

Estimated Yields

Estimated potential yields per acre of principal crops on soils of Luna County are shown in table 2. The estimates are based on information from research and from interviews with farmers and others. Yields shown are for cotton, barley, grain sorghum, alfalfa, pinto beans, and tomatoes under the best levels of management.

Not included in table 2 are soils that are used only for range and soils of such limited irrigated acreage that reliable data on yields are not available. Although crops other than those listed are grown in Luna County, they are not listed because the acreage is small or reliable data are not available.

Under high-level management—

1. The cropping system is one of adequate high-residue and soil-improving crops.
2. Adapted proven crop varieties or strains are planted at the proper time and at the correct planting rate.
3. Recommended amounts and kinds of fertilizer are applied at the proper time.
4. Tillage is done carefully at the right time with the right kind of implements; thus, crop residue is managed, weeds are controlled, and excessive compaction is prevented.
5. Insects and plant diseases are controlled chemically or by other means.
6. Irrigation runs are of proper length and slope.
7. Irrigation water is applied when needed and in accordance with crop needs.
8. Harvest is at the proper time.

Range[2]

More than 80 percent of Luna County is cattle range. Ranching is predominantly a cow-calf enterprise. Ranches vary considerably in size, ranging from small units of less than 5,000 acres to large units of many thousands of acres.

The climate is suited to year-round grazing. Supplemental feeding is common during winter months and in years of below-normal precipitation. Rainfall fluctuates widely from year to year and flexibility in livestock numbers is needed.

Three threatened or unusual species of plants grow on range in Luna County. *Coryphantha orcuttii,* a small cactus, grows in the Florida and Hatchet Mountains. *Echinocereus chloranthus,* another small cactus, grows exclusively in the Cook's Range. *Ferocactus* (also *Echinocactus*) *wislizenii*—common Barrelcactus—is threatened in Luna County because it is collected and used in landscaping.

Range sites and condition classes

A range site is a distinctive kind of range that produces a characteristic natural plant community. It is a product of the soil, the climate, and the vegetation. Soils that have the capacity to produce the same kind, amount, and proportion of range plants are grouped into range sites.

The potential or climax vegetation of a range site is the native plant community best suited to the particular environmental complex of the site. These plant communities are fairly stable and are in dynamic equilibrium with the environment.

An abnormal disturbance, such as overuse by livestock, excessive burning, or plowing, results in changes in the potential plant community or even complete destruction if the disturbance is drastic enough. If the range site is not deteriorated significantly by water erosion or soil blowing under such disturbance, secondary plant succession progresses in the direction of the natural potential or climax plant community for the site.

Range conservationists and soil scientists determine the natural potential plant communities on individual soil units and then group those soils into range sites.

Range condition is the present state of the vegetation or plant community on a range site. It is related to the potential plant community for the site. The main purpose in determining range condition is to provide an index of the changes that have taken place in the plant cover. When the potential plant community for a site is known, the present condition can be determined, thereby providing a basis for predicting the nature and direction of plant community changes to be expected.

When changes occur in the potential plant community as a result of a particular kind of use or disturbance, some plant species increase, others decrease. How a plant reacts to grazing depends on the kinds of animals grazing, the season of use, and the degree to which plant tissue is removed. By comparing the composition of the present condition to the potential plant community, it is possible to see how some individual species increase and others decrease. Plants that are not part of the potential community are designated as invaders.

The composition of plant communities, both potential and present condition, and other range site information, provide the basis for planning management objectives, designing grazing systems, managing wildlife, determining recreational potential, and evaluating hydrologic conditions on a given site.

Increasing the number of desirable plants and restoring the range to as near potential condition as is reasonably feasible are the chief management objectives. At times the plant community can be somewhat removed from the potential in order to supply specific needs in the grazing program or to provide wildlife habitat or other benefits. Any management objective must be compatible with conservation objectives and provide a plant community that protects and improves soil and water resources.

Under good range management–

1. The quality and quantity of desirable vegetation are maintained or improved and adequate plant residue is left to protect the soil surface. Research and experience show that as a general rule not more than 50 percent of the current year's growth, by weight, should be removed from the plant during the growing period.
2. An improved grazing program provides systematic intervals of grazing use and nonuse during the year and is beneficial to both wildlife and livestock and to the natural vegetation.
3. Deferment of grazing during the growing period, which allows plants to regain their vigor and produce seed, is especially effective in increasing production on range that is in fair to good condition.
4. Fencing controls and distributes livestock. Properly located fences that divide the ranch into manageable areas are especially needed.
5. Placing salt, minerals, and supplemental feed in or near undergrazed areas and moving these feeding stations periodically provide uniformity and desirable distribution of livestock.
6. Pipelines, wells, earthen ponds, and artificial water impoundments provide adequate and dependable supplies of water in each pasture and also influence livestock distribution.
7. Seeding improved native grasses on critically deteriorated range and abandoned fields increases the forage resources and helps control accelerated erosion.
8. Controlling competitive brush, cactus, and weeds provides more available moisture to the remaining vegetation. Mesquite, American tarbush, and creosotebush are the dominant woody invaders in Luna County.

Climatic zones

The seven climatic zones (*4*) in New Mexico correlate areas that have definite climatic limitations with

[2] JAMES C. POWELL, range conservationist, Soil Conservation Service, helped prepare this section.

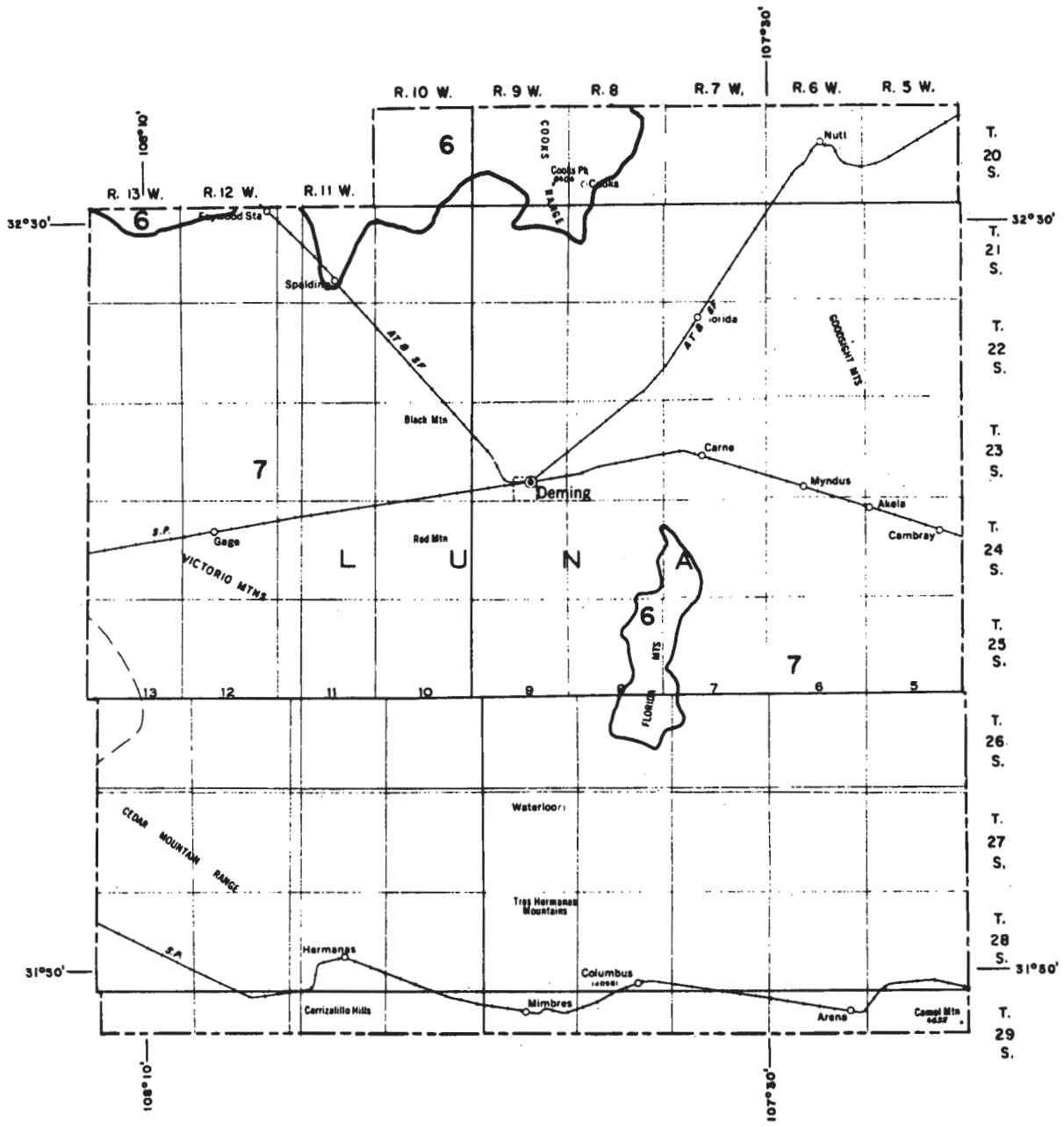

Figure 14.—**Climatic zones in Luna County. The crop moisture index is 50 to 110 in zone 6 and 10 to 50 in zone 7.**

the system of capability classifications used by the Soil Conservation Service. They predict the climatic limitations on range and other dryfarmed areas.

The capability classification system used by the Soil Conservation Service is explained under the heading Use and Management of the Soils.

In general, the higher the climatic zone number the more severe the climatic limitation for crop or forage production. For example, zone 1 has no climatic limitation, and any limitation in this zone is not a result of climate. Zone 7 has severe climatic limitations even if all other factors are favorable for crop production. Two climatic zones, 6 and 7, are recognized in Luna County. The extent and distribution of these zones are shown in figure 14.

Zone 6 has such severe climatic limitations that it is unsuitable for cultivation unless irrigated. It has a mean annual precipitation of about 12 inches. It can be managed as pasture or native range for increased forage production. Unless otherwise limited, soils in this zone respond to seeding and fertilization. Water control by diversions or water spreaders is practical.

Zone 7 has very severe climatic limitations and is also unsuitable for cultivation unless irrigated. The mean annual precipitation is about 8 inches. Seeding and fertilization are impractical. If well managed, the

range can be grazed. If it is allowed to deteriorate, reclamation is almost possible, even under the best management.

The potential vegetation composition and yield mentioned in the descriptions of range sites on the pages that follow are for soils in climatic zone 7. The total yield in climatic zone 6 is about 10 to 15 percent higher than in climatic zone 7. Also there is some change in percent composition and species.

Descriptions of range sites

On the following pages are descriptions of the range sites of Luna County, the climax plants and principal invaders, and an estimate of the potential annual yield of air-dry vegetation for each site in excellent condition. The soils in each site can be determined by referring to the Guide to Mapping Units at the back of this publication.

BOTTOMLAND RANGE SITE

The soils of this site have a surface layer of sandy loam, very fine sandy loam, loam, silt loam, silty clay loam, or clay loam and underlying layers of sandy loam or clay or silty clay. These soils are well drained or moderately well drained. They have moderate to very slow permeability and slow runoff. Because they are in swales and on bottom lands, they are flooded occasionally. The available water capacity is high. Slopes are 0 to 1 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 50 percent giant sacaton; 20 percent tobosa; 10 percent each vine-mesquite and alkali sacaton; and 5 percent each blue grama and burrograss. Other species are dropseed, three-awn, and annual forbs and grasses.

Under continuous heavy grazing, the alkali sacaton, vine-mesquite, and giant sacaton are replaced chiefly by tobosa, burrograss, and annual forbs. Mesquite and American tarbush frequently invade the site.

This site is generally the most productive in the county and is easily accessible to livestock if water is available (*3*). If the range is in excellent condition, the total annual yield of all vegetation ranges from 2,500 pounds per acre, air-dry weight, in favorable years to 500 pounds in unfavorable years.

BREAKS RANGE SITE

The soils of this range site have a surface layer of stony, rocky, cobbly, or very gravelly loam or clay loam and underlying layers of very gravelly, cobbly, or stony loam, clay loam, or clay. Bedrock is within a depth of 20 inches. The soils are well drained. They have moderate to slow permeability and medium runoff. The available water capacity is very low to low. Slopes are 10 to 25 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 20 percent each black grama and side-oats grama; 10 percent each blue grama and bush muhly; and 5 percent each agave (not generally grazed by cattle), green sprangletop, Hall's panicum, oak brush, three-awn, one-seeded juniper (not generally grazed by cattle), plains lovegrass, and four-wing saltbush. Other species are metcalfe muhly, cane beardgrass, sotol, slim tridens, curly mesquite, and tobosa.

Under continuous heavy grazing, the grama grasses, bush muhly, and plains lovegrass are replaced by one-seeded juniper, three-awn, oak brush, and curly mesquite. Creosotebush, mesquite, and fluffgrass invade the site.

Topography makes some parts of this site less accessible to livestock than surrounding range sites. Adequate watering facilities contribute greatly to improved grazing distribution. If the range is in excellent condition, the total annual yield of all vegetation ranges from 900 pounds per acre, air-dry weight, in favorable years to 350 pounds in unfavorable years.

CLAYEY RANGE SITE

The soils of this range site dominantly have a surface layer of gravelly clay loam, silty clay loam, or clay loam and underlying layers of silty clay loam, gravely clay loam, silty clay, loamy sand, or clay. In places a very thin surface layer of loam or sandy clay loam occurs. The soils are well drained. They have moderately slow to slow permeability and slow to rapid runoff. The available water capacity is moderate to high. Slopes are mainly 0 to 3 percent but in places range from 10 to 25 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 20 percent tobosa; 15 percent alkali sacaton; 10 percent each black grama, blue grama, bush muhly, and vine-mesquite; and 5 percent each burrograss, three-awns, American tarbush (not generally grazed by cattle), four-wing saltbush, and broom snakeweed (poisonous, not generally grazed by cattle). Other species are annual forbs, such as desert holly, buckwheat, and mustards, and annual grasses, such as six-weeks grama.

Under prolonged heavy grazing, the alkali sacaton, black grama, blue grama, and bush muhly are replaced mainly by tobosa, American tarbush, three-awn, burrograss, and broom snakeweed. Mesquite and creosotebush invade the site.

This site is easily accessible to livestock if water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 475 pounds per acre, air-dry weight, in favorable years to 125 pounds in unfavorable years.

DEEP SAND RANGE SITE

The soils of this range site have a surface layer of sandy loam, loamy sand, or gravelly loamy sand and underlying layers of sand, loamy sand, gravelly loamy sand, or sandy loam. The soils are somewhat excessively drained, excessively drained, or well drained. The soils have rapid to moderate permeability and slow runoff. The available water capacity is low. Slopes are 0 to 10 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 25 percent each black grama and giant dropseed; 15 percent mesa dropseed; 10 percent sand sagebrush (generally not grazed or lightly grazed); 5 percent each spike dropseed, bush muhly, three-awn, and yucca and feather dalea (both of which are generally not grazed or lightly grazed). Other species are sand dropseed, range ratany, four-wing saltbush, and fluffgrass.

Under prolonged heavy grazing, black grama, giant dropseed, and bush muhly are replaced by mesa drop-

seed, spike dropseed, fluffgrass, and sand sagebrush. Mesquite and various annual forbs invade the site.

This site is easily accessible to livestock if water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 650 pounds per acre, air-dry weight, in favorable years to 150 pounds in unfavorable years.

GRAVELLY RANGE SITE

The soils of this range site generally have a surface layer of very gravelly clay loam to gravelly sand and underlying layers of very gravelly and cobbly clay to very gravelly sand. In places a thin nongravelly surface layer occurs. The soils are well drained to excessively drained. They have slow to very rapid permeability and slow to medium runoff. The available water capacity is low. Slopes are 0 to 10 percent.

The approximate species composition, by weight, of climax, or potential, plant community is 20 percent black grama; 15 percent tobosa; 10 percent each bush muhly, side-oats grama, blue grama, and three-awn; and 5 percent each winterfat, cane beardgrass, sand dropseed, buckwheat, and fluffgrass. Fluffgrass generally is grazed by cattle and horses only if other forage is extremely scarce. Other species are Arizona cottontop, four-wing saltbush, plains bristlegrass, and ear muhly.

Under prolonged heavy grazing, black grama, bush muhly, side-oats grama, and winterfat are replaced by three-awn, tobosa, fluffgrass, and sand dropseed. Creosotebush and mesquite and occasionally American tarbush invade the site.

This site is generally easily accessible to livestock if adequate water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 650 pounds per acre, air-dry weight, in favorable years to 150 pounds in unfavorable years.

GYP FLATS RANGE SITE

The soils of this site have a surface layer of loam or sandy loam and underlying layers of loam and sandy loam. Soft, powdery gypsum is within a depth of 3 to 30 inches. The soils are well drained. They have moderate permeability and medium runoff. The available water capacity is very low. Slopes are 0 to 3 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 40 percent alkali sacaton; 10 percent each black grama, three-awn, and tobosa; and 5 percent each bush muhly, four-wing saltbush, gyp grama, burrograss, American tarbush, and broom snakeweed. American tarbush and broom snakeweed are rarely grazed by cattle and horses. Broom snakeweed is poisonous. Other species are grama, Mormontea, gyp dropseed, and yucca.

Under prolonged heavy grazing, alkali sacaton, black grama, bush muhly, and gyp grama are replaced by three-awn, burrograss, American tarbush, broom snakeweed, and tobosa. Creosotebush and mesquite invade the site.

This site is easily accessible to livestock if adequate water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 700 pounds per acre, air-dry weight, in favorable years to 100 pounds in unfavorable years.

HILLS RANGE SITE

The soils of this range site have a surface layer of extremely rocky, cobbly, gravelly, or stony loam or clay loam and underlying layers of loam, clay loam, sandy clay loam, or clay that are typically stony or cobbly. Bedrock generally is within a depth of 20 inches. The soils are well drained. They have very slow to slow permeability and medium to very rapid runoff. The available water capacity is very low to low. Slopes are 0 to 75 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 20 percent side-oats grama; 15 percent black grama; 10 percent each bush muhly, blue grama, and tobosa; 5 percent each cane beardgrass, green sprangletop, one-seeded juniper (not generally grazed), oak brush, yucca (not generally grazed), curly mesquite, and agave (not generally grazed). Other species are Arizona cottontop, hairy grama, four-wing saltbush, plains lovegrass, winterfat, and Hall's panicum.

Under prolonged heavy grazing, side-oats grama, black grama, bush muhly, blue grama, cane beardgrass, and green sprangletop are replaced by one-seeded juniper, oak brush, curly mesquite, tobosa, and yucca. Mesquite, fluffgrass, and creosotebush invade the site.

This site provides protection for cattle in winter, but it is not easily accessible. Adequate watering facilities are needed. Livestock trails are needed also for uniform grazing distribution. If the range is in excellent condition, the total annual yield of all vegetation ranges from 950 pounds per acre, air-dry weight, in favorable years to 150 pounds in unfavorable years.

LIMESTONE HILLS RANGE SITE

The soils of this range site are extremely rocky or stony loams. Limestone generally is within a depth of 20 inches. The soils are well drained. They have moderate permeability and rapid to very rapid runoff. The available water capacity is very low. Slopes are 0 to 25 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 15 percent each black grama and metcalfe muhly; 10 percent each side-oats grama and sacahuista; and 5 percent each bush muhly, plains lovegrass, blue grama, rough tridens, sand dropseed, oak brush, agave (not generally grazed), sotol (not generally grazed), three-awn, and lippia. Cattle graze sacahuista when other forage is dormant or in short supply. Sacahuista can be poisonous under certain conditions. Other species are hairy grama, broom snakeweed, slim tridens, ocotillo, and Arizona cottontop.

Under prolonged heavy grazing, black grama, side-oats grama, metcalfe muhly, bush muhly, plains lovegrass, and blue grama are replaced by three-awn, oak brush, sand dropseed, and sacahuista. Mesquite and American tarbush invade the site.

This site provides some winter protection for cattle. It is accessible, but adequate watering facilities are essential. If the range is in excellent condition, the total yield of all vegetation ranges from 650 pounds per acre, air-dry weight, in favorable years to 250 pounds in unfavorable years.

LIMY RANGE SITE

The soils of this range site have a surface layer of fine sandy loam, silty clay loam, or very gravelly sandy loam to gravelly loam and underlying layers of loam, clay loam, silty clay loam, gravelly to very gravelly sandy clay loam, or gravelly to very gravelly loam and sandy loam that are very high in content of lime. The soils are well drained. They have slow to moderate permeability and slow to medium runoff. The available water capacity is very low to high. Slopes are 0 to 10 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 15 percent each black grama, bush muhly, and creosotebush (not generally grazed); 10 percent each dropseed, three-awn, and American tarbush (not generally grazed); and 5 percent each winterfat, side-oats grama, fluffgrass (not generally grazed), broom snakeweed (not generally grazed, can be poisonous), and annuals. Other species are blue grama, four-wing saltbush, plains bristlegrass, burrograss, ear muhly, and range ratany.

Under prolonged heavy grazing, black grama, bush muhly, winterfat, and side-oats grama are replaced by dropseed, fluffgrass, creosotebush, and American tarbush. Mesquite and exotic annuals invade the site.

This site is generally easily accessible to cattle if water is available. Range condition is often seriously deteriorated. If the range is in excellent condition, the total annual yield of all vegetation ranges from 475 pounds per acre, air-dry weight, in favorable years to 50 pounds in unfavorable years.

LOAMY RANGE SITE

The soils of this range site have a surface layer of sandy clay loam or loam and underlying layers of sandy clay loam, clay loam, or silty clay loam. The soils are well drained. They have moderately slow to moderate permeability and slow to medium runoff. The available water capacity is moderate to high. Slopes are 0 to 3 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 25 percent black grama; 15 percent bush muhly; 10 percent each blue grama, burrograss, sand dropseed, and tobosa; and 5 percent each cane beardgrass, fluffgrass (not generally grazed by cattle), three-awns, and broom snakeweed. Broom snakeweed can be poisonous, but it is not generally grazed by cattle. Other species are winterfat, alkali sacaton, sand muhly, and annuals.

Under prolonged heavy grazing, black grama, bush muhly, cane beardgrass, and blue grama are replaced by burrograss, sand dropseed, fluffgrass, tobosa, broom snakeweed, and three-awn. Mesquite and creosotebush invade the site.

This site is easily accessible to livestock if water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 575 pounds per acre, air-dry weight, in favorable years to 75 pounds in unfavorable years.

MALPAIS RANGE SITE

The soils of this range site are very gravelly and cobbly loams. Basalt is within a depth of 20 inches. The soils are well drained. They have moderate permeability and medium runoff. The available water capacity is very low. Slopes are 0 to 10 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 35 percent tobosa; 10 percent each black grama, side-oats grama, bush muhly, and dropseed; and 5 percent each green sprangletop, blue grama, yucca (not generally grazed), hairy tridens, and three-awn. Other species are silver bluestem, vine-mesquite, winterfat, ring muhly, and alkali sacaton.

Under prolonged heavy grazing, black grama, side-oats grama, bush muhly, and green sprangletop are replaced by tobosa, three-awn, hairy tridens, and dropseed. Mesquite, creosotebush, and American tarbush invade the site.

This site is accessible to livestock if adequate water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 750 pounds per acre, air-dry weight, in favorable years to 225 pounds in unfavorable years.

SALT FLATS RANGE SITE

The soils of this site have a surface layer of silty clay loam or loam and underlying layers of silty clay loam, sandy clay, silty clay, or clay. The substratum is loam or silty clay loam to sandy clay loam. It is below a depth of 40 inches. The soils are well drained. They have slow to very slow permeability and slow runoff. The available water capacity is moderate. Slopes are 0 to 3 percent. The soils are moderately to strongly alkali affected.

The approximate species composition, by weight, of the climax, or potential, plant community is 45 percent alkali sacaton; 15 percent four-wing saltbush; 10 percent each vine-mesquite and three-awn, and 5 percent each tubercled saltbush (rarely grazed), burrograss, saltgrass, and annual forbs. Other species are iodinebush, seepweed, shadscale, tobosa, and blue grama.

Under prolonged heavy grazing, alkali sacaton, four-wing saltbush, and vine-mesquite are replaced by burrograss, tubercled saltbush, and three-awn. Mesquite and creosotebush invade the site.

This site is easily accessible to livestock if adequate water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 975 pounds per acre, air-dry weight, in favorable years to 125 pounds in unfavorable years.

SALTY BOTTOMLAND RANGE SITE

The soils of this range site have a surface layer of silty clay loam and underlying layers of silty clay and clay. The soils are moderately well drained. They have very slow permeability and slow runoff. Because they are in swales and on bottom lands, they generally receive some runoff from surrounding areas. Available water capacity is moderate to high. Slopes are 0 to 1 percent. The soils are moderately alkali affected.

The approximate species composition, by weight, of the climax, or potential, plant community is 30 percent alkali sacaton; 10 percent each giant sacaton, four-wing saltbush, vine-mesquite, burrograss, saltgrass, and tubercled saltbush (not generally grazed); and 5 percent each three-awn and tobosa. Other species are blue grama, iodinebush, and annuals.

Under prolonged heavy grazing, alkali sacaton,

four-wing saltbush, and vine-mesquite are replaced by burrograss, saltgrass, three-awn, tobosa, and tubercled saltbush. Mesquite and saltcedar invade the site.

This site is easily accessible to livestock if adequate water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 1,500 pounds per acre, air-dry weight, in favorable years to 275 pounds in unfavorable years.

SAND HILLS RANGE SITE

The soils of this range site have a surface layer of loam, sandy loam, and loamy fine sand to sand and underlying layers of loamy fine sand, loam, silt loam, or silty clay loam. The soils are well drained to somewhat excessively drained. They have moderately slow to rapid permeability and slow to medium runoff. The available water capacity is low to high. Slopes are 0 to 5 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 30 percent giant dropseed; 25 percent spike dropseed; 10 percent each black grama, sand sagebrush (not generally grazed), and mesa dropseed; and 5 percent each plains bristlegrass, feather dalea (not generally grazed), and yucca (not generally grazed). Other species are three-awn, sand dropseed, and silver bluestem.

Under prolonged heavy grazing, giant dropseed, black grama, and plains bristlegrass are replaced by spike dropseed, sand sagebrush, and mesa dropseed. Mesquite readily invades the site.

This site is easily accessible to livestock if water is available. The site is highly susceptible to soil blowing and is often characterized by coppice dunes when deteriorated. Management to control or reduce the competition by mesquite is generally required. If the range is in excellent condition, the total annual yield of all vegetation ranges from 650 pounds per acre, air-dry weight, in favorable years to 125 pounds in unfavorable years.

SANDY RANGE SITE

The soils of this range site have a surface layer of fine sandy loam, sandy loam, gravelly sandy loam, loamy fine sand, or loamy sand and underlying layers of gravelly sandy loam, sandy loam, sandy clay loam, loam, clay loam, silty clay, or clay. The soils are well drained. They have slow to moderately rapid permeability and slow to medium runoff. The available water capacity is low to high. Slopes are 0 to 5 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 40 percent black grama; 20 percent mesa dropseed; 10 percent each blue grama and bush muhly; and 5 percent each Mormontea (not generally grazed), yucca (not generally grazed), and sagebrush (not generally grazed), and annuals. Other species are Arizona cottontop, buckwheat, plains bristlegrass, and sand muhly.

Under prolonged heavy grazing, black grama, blue grama, and bushy muhly are replaced by mesa dropseed, annuals, Mormontea, and buckwheat. Mesquite and fluffgrass invade the site.

This site is easily accessible to livestock if water is available. Soil blowing is a hazard. If the range is in excellent condition, the total annual yield of all vegetation ranges from 750 pounds per acre, air-dry weight, in favorable years to 150 pounds in unfavorable years.

SHALLOW RANGE SITE

The soils of this range site have a surface layer of extremely rocky loam, extremely stony sandy loam, or sandy loam and loamy sand. Some have underlying material of gravelly clay loam, clay, stony clay loam, or gravelly sandy clay loam and sandy loam. Others have indurated caliche or bedrock within a depth of 20 inches. The soils are well drained. They have slow to moderately rapid permeability and slow to rapid runoff. The available water capacity is very low. Slopes are 0 to 10 percent.

The approximate species composition, by weight, of the climax, or potential, plant community is 20 percent each bush muhly, black grama, and three-awn; 10 percent annual grasses; and 5 percent each winterfat, New Mexico feathergrass, fluffgrass (not generally grazed), burrograss, and annual forbs. Other species are side-oats grama, sand dropseed, tobosa, and blue grama.

Under prolonged heavy grazing, bush muhly, black grama, winterfat, New Mexico feathergrass, and side-oats grama are replaced by fluffgrass, burrograss, three-awns, and annuals. Creosotebush, mesquite, and American tarbush invade the site.

This site is easily accessible to livestock if adequate water is available. If the range is in excellent condition, the total annual yield of all vegetation ranges from 550 pounds per acre, air-dry weight, in favorable years to 125 pounds in unfavorable years.

Woodland

There is no commercial timber in Luna County. Some ponderosa pines are on the high north slope of Cook's Peak, but they are few and the stands are too open and of too poor quality to have any economic value as commercial timber. Other noncommercial native trees in Luna County are cottonwood, sycamore, desert willow, desert walnut, Rocky Mountain juniper, pinyon pine, one-seeded juniper, and shrub live oak.

Cottonwood, sycamore. desert walnut, and desert willow grow in open stands along major drainageways, generally along the upper part of the Mimbres River. Cottonwood and Arizona sycamore are used locally, to a small extent, as fuel. They are on Riverwash where they receive runoff from surrounding areas.

Scattered open stands of Rocky Mountain juniper and a few pinyon pine, one-seeded juniper, and shrub live oak grow in most of the hilly and mountainous areas of Luna County. Shrub live oaks generally are along drainageways in mountainous areas. They are used locally as a source of fuel and as fence posts. They are mainly on Rough broken and rock land.

Some trees are planted for windbreaks in Luna

Figure 15.—**Top: Single row of bamboo plantings, a field windbreak in an irrigated area of Mimbres silty clay loam. Bottom: Windbreak of Arizona cypress on Mimbres silty clay loam.**

TABLE 3.—*Expected height and survival, by age, of selected species on regularly irrigated soils*

[Vigor for all species is expected to be good]

Soil	Species	Age	Height	Survival
		Years	*Feet*	*Percent*
Gila loam	Arizona cypress	16	34	100
	Mulberry	18	31	80
	Rocky Mountain juniper	13	15	100
Harkey sandy loam	Oriental arborvitae	13	20	92
Mimbres silty clay loam	Arizona cypress	8	17	92
Mohave sandy clay loam, 0 to 1 percent slopes	Arizona cypress	12	25	100
Sonoita gravelly sandy loam	Arizona cypress	12	25	100
Stellar silty clay loam, 0 to 1 percent slopes	Arizona cypress	13	22	92

County. They must be irrigated for growth and survival. If irrigated regularly, all but the very limy or strongly alkali soils are well suited to adapted species of trees for windbreaks. Poorly suited are Jal, Nickel, Karro, or Hondale soils. Figure 15 shows windbreak plantings of bamboo and Arizona cypress. Other well suited trees and shrubs are eastern redcedar, honey locust, mulberry, Oriental arborvitae, osageorange, Rocky Mountain juniper, Russian-olive, Siberian elm, skunkbush sumac, and tamarisk.

Table 3 shows the expected height and survival of selected species on selected, regularly irrigated soils.

Wildlife[3]

Wildlife is one of the natural resources of Luna County. The soils have determined, in part, the past and present land use. The soils and land use, in turn, have determined the dominant vegetation. Wildlife, as a crop of the land, basically depends on the soils and is strongly influenced by man's use of the soils. The soils, the history of land use, and the climate of Luna County strongly influence the diversity, quantity, and quality of existing wildlife habitat.

The only woodland habitat in the county is at the higher elevations in the Cook's Range, Florida Mountains, and Tres Hermanos Mountains. It is largely of the pinyon-juniper type, intermingled with small stands of ponderosa pine.

There are no natural lakes or ponds except the small, seasonally flooded playas. All surface runoff in the county is ephemeral. Wetland habitat is exclusively associated with manmade irrigation improvement.

Range habitat characteristically reflects the severe dry moisture regime and the long history of livestock grazing. Plant communities are simple; many are monotypic, and the dominant plants have little browse value.

Crops are confined to areas where irrigation water is available. The influence of hay and grain crops is important to mourning doves, and is of some local significance to scaled quail populations.

Important game species of some abundance within Luna County are mule deer, javelina, pronghorn antelope, scaled and Gambel's quail, and mourning dove. Other wildlife species are jack rabbit, coyote, kangaroo rat, ground squirrel, ringtail cat, bobcat, raven, and roadrunner. There is a large population of resident and migratory songbirds.

Of particular interest are the wintering populations of large raptors, the golden eagles and rough-legged, ferruginous, and marsh hawks. Swainson's and red tailed hawks are the dominant nesting species. Three species of raptors classified as rare and endangered species have been reported in the county. Black hawks have been sighted near Animas, and aplomado falcons are associated with the soaptree yucca (Yucca elata), a plant cover over much of the county. Zone-tailed hawks have been reported nesting in the Victorio Mountains south of Gage.

The Mexican duck, another rare and endangered species, is known to utilize some of the constructed ponds in the county.

Both greater and lesser sandhill cranes winter near the small ephemeral playas in the southern part of the county and in adjacent Mexico.

Under the exotic mammal introduction program of the New Mexico Department of Game and Fish, the Florida Mountains were experimentally stocked with Iranian ibex. The small number of animals initially stocked have reproduced, and the introduction has been considered successful.

The distribution of wildlife species within the county can be related to the suitability of the soils for the production of specific vegetation. The habitat and spatial requirements for most native wildlife species is fairly well understood.

In table 4 the soils of Luna County are rated according to their suitability for specific wildlife habitat elements. Ratings reflect conditions with and without supplemental irrigation as applicable.

Grain and seed crops are domestic grain or other seed-producing annuals planted to produce wildlife food. Corn, sorghum, wheat, oats, barley, millet, and sunflowers are examples.

Domestic grasses and legumes are perennial grasses and herbaceous legumes planted for wildlife food and cover. Fescue, lovegrass, switchgrass, orchardgrass, clover, alfalfa, and bermudagrass are examples.

Wild herbaceous plants are native or established range grasses and forbs that provide food and cover

[3] EDWIN A. SWENSON, JR., biologist, Soil Conservation Service, helped prepare this section.

TABLE 4.—*Suitability of the soils for wildlife habitat*

[Asterisks indicate irrigated units. Ratings apply to all soils in a mapping unit unless otherwise specified]

Soil series and map symbols	Elements of wildlife habitat				Kinds of wildlife	
	Grain and seed crops	Domestic grasses, legumes	Wild herbaceous plants	Shrubs	Openland	Rangeland
Akela: AG, AK	Very poor	Very poor	Fair	Fair	Poor	Fair.
Arizo: AV						
Arizo part	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Vinton part	Very poor	Very poor	Fair	Poor	Poor	Poor.
Berino: BA	Very poor	Very poor	Fair	Fair	Poor	Fair.
Bluepoint:						
*Bd	Fair	Fair	Poor	Poor	Fair	Poor.
Bd, BG	Very poor	Very poor	Poor	Poor	Poor	Poor.
Be	Very poor	Very poor	Poor	Poor	Very poor	Poor.
BO	Very poor	Very poor	Fair	Poor	Poor	Poor.
Brenda: BR	Very poor	Very poor	Fair	Fair	Poor	Fair.
Cottonwood: CO	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Dona Ana:						
*Da	Good	Good	Good	Good	Good	Good.
Da, Dc	Very poor	Very poor	Fair	Fair	Poor	Fair.
*Dc	Good	Good	Fair	Fair	Fair	Fair.
Dp	Very poor	Very poor	Poor	Poor	Poor	Poor.
Dune land-Pintura: DT	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Eba: EG, Eb	Very poor	Very poor	Fair	Fair	Poor	Fair.
Gila:						
*Ga, *Gm	Good	Good	Good	Good	Good	Good.
Gh, Gm	Very poor	Very poor	Fair	Fair	Poor	Fair.
Graham: GR	Very poor	Very poor	Fair	Fair	Poor	Fair.
Harkey:						
*Ha, *Hk	Good	Good	Good	Good	Good	Good.
Ha, Hk	Very poor	Very poor	Good	Good	Poor	Good.
Hh	Very poor	Very poor	Fair	Fair	Poor	Fair.
Hondale:						
*Ho	Poor	Poor	Poor	Poor	Poor	Poor.
*Hr	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Ho, Hr, Hs, HT, HU	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Hondale part.						
HU	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Bluepoint part.						
Jal:						
*Ja	Poor	Poor	Poor	Poor	Poor	Poor.
Ja	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Karro:						
*Ka	Good	Good	Fair	Fair	Fair	Fair.
Ka	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Ledru: LC	Very poor	Very poor	Fair	Fair	Poor	Fair.
Lehmans: LD, LK	Very poor	Very poor	Fair	Fair	Poor	Fair.
Lozier: LM	Very poor	Very poor	Fair	Fair	Poor	Fair.
Luxor: LU	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Maricopa:						
*Ma	Fair	Fair	Good	Good	Good	Good.
Ma	Very poor	Very poor	Fair	Poor	Poor	Fair.
Mah	Very poor	Very poor	Poor	Poor	Poor	Poor.

TABLE 4.—*Suitability of the soils for wildlife habitat*—Continued

Soil series and map symbols	Elements of wildlife habitat				Kinds of wildlife	
	Grain and seed crops	Domestic grasses, legumes	Wild herbaceous plants	Shrubs	Openland	Rangeland
Mimbres:						
*Mb	Good	Good	Good	Good	Good	Good.
Mb, Mc, Me, MM, Mn, MR	Very poor	Very poor	Fair	Fair	Poor	Fair.
*Mc, *Me	Good	Good	Fair	Fair	Fair	Fair.
*Md	Fair	Poor	Fair	Fair	Poor	Fair.
Md	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Mohave:						
*Ms	Good	Good	Good	Good	Good	Good.
Ms, Mt, MU	Very poor	Very poor	Fair	Fair	Poor	Fair.
*Mt	Good	Good	Fair	Fair	Fair	Fair.
Mv (Mohave part)	Very poor	Very poor	Poor	Poor	Poor	Poor.
Mv (Pintura part)	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Nickel:						
*NK	Fair	Fair	Fair	Fair	Fair	Fair.
NK, NT	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Pintura-Berino:						
PB (Pintura part)	Very poor	Very poor	Poor	Poor	Very poor	Poor.
PB (Berino part)	Very poor	Very poor	Poor	Poor	Poor	Poor.
Pintura-Simona:						
PS (Pintura part)	Very poor	Very poor	Poor	Poor	Very poor	Poor.
PS (Simona part)	Very poor	Very poor	Fair	Fair	Poor	Fair.
Riverwash: RE	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Rock land: RO	Very poor	Very poor	Fair	Fair	Poor	Fair.
Rough broken and Rock land: RU	Very poor	Very poor	Fair	Fair	Poor	Fair.
Simona: SD	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Sonoita:						
*Sn	Good	Good	Good	Good	Good	Good.
SO	Very poor	Very poor	Fair	Fair	Poor	Fair.
Ss	Very poor	Very poor	Poor	Poor	Poor	Poor.
Stellar:						
ST, SU, Sw	Very poor	Very poor	Fair	Fair	Poor	Fair.
*Sw	Good	Good	Fair	Fair	Fair	Fair.
Stony land: SX	Very poor	Very poor	Fair	Fair	Poor	Fair.
Tres Hermanos: TH	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Turney-Dona Ana:						
TU (Turney part)	Very poor	Very poor	Poor	Poor	Very poor	Poor.
TU (Dona Ana part)	Very poor	Very poor	Fair	Fair	Poor	Fair.
Upton:						
*UG	Very poor	Poor	Poor	Poor	Poor	Poor.
UG, UP	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Verhalen:						
*Ve	Fair	Fair	Good	Good	Good	Good.
Ve	Very poor	Very poor	Good	Fair	Poor	Fair.
*Vh	Poor	Poor	Fair	Fair	Poor	Fair.
Vh	Very poor	Very poor	Poor	Poor	Very poor	Poor.
Yturbide:						
*Yt	Fair	Fair	Fair	Fair	Fair	Fair.
Yt	Very poor	Very poor	Fair	Poor	Poor	Poor.

for wildlife. Examples are grama grass, lovegrass, alkali sacaton, tobosa, dropseed, bush muhly, burrograss, broom snakeweed, croton, lambsquarter, globemallow, and Russian thistle.

Shrubs are native or established woody shrubs that produce browse or mast for wildlife food or that provide cover for wildlife. Four-wing saltbush, mesquite, oak brush, rabbitbrush, sand sagebrush, allthorn, creosotebush, and yucca are examples.

The criteria for rating soils for these wildlife habitat elements are thickness of soil, texture, available water capacity, drainage, surface stoniness, flooding frequency, slope, salinity or alkalinity, and moisture regime. Suitability is expressed as good, fair, poor, or very poor.

Also in table 4 the soils are rated according to their suitability for producing all the essential habitat elements required for two general types of wildlife. A weighted factor was assigned to selected habitat elements to arrive at a suitability rating.

Openland wildlife are birds and mammals of cropland, pasture, meadow, and other farm-associated uses. Examples are scaled quail, mourning dove, cottontail rabbit, skunk, and Western kingbird. All habitat elements were considered.

Rangeland wildlife are birds and mammals of native grasslands, shrublands, and pinyon-juniper forest types. Gambel's quail, burrowing owl, marsh hawk, meadowlark, Cassin's sparrow, jack rabbit, pronghorn antelope, and horned lark are examples. Only wild herbaceous plants and shrubs were considered.

Suitability is expressed as good, fair, poor, and very poor.

Good means that habitat is easily improved, maintained, or created. There are few or no soil limitations in habitat management and satisfactory results can be expected.

Fair means that habitat can be improved, maintained, or created but moderate soil limitations affect habitat management or development. A moderate intensity of management and fairly frequent attention may be required to insure satisfactory results.

Poor means that habitat can be improved, maintained, or created but soil limitations are severe. Habitat management may be difficult and expensive and require intensive efforts. Results are questionable.

Very poor means that under the prevailing conditions, it is impractical to attempt to improve, maintain, or create habitat. Unsatisfactory results are probable.

The ratings in table 4 are based on potential, not the present land use condition.

Engineering[4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds, and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, estimates of soil properties significant in engineering, interpretations for various engineering uses, and results of engineering laboratory tests.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 6, and it also can be used to make other useful maps.

The information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 5 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit contain small areas of other kinds of soil that have strongly contrasting properties and different suitability or limitations for engineering structures.

Some of the terms used in this soil survey have special meaning in soil science that may not be familiar to engineers. The Glossary defines many terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils are the Unified Soil Classification System (*8*) established by the Corps of Engineers, Department of Defense, and others, and the AASHTO system (*1*) adopted by the American Association of State Highway and Transportation Officials.

The Unified system classifies soils according to those properties that affect use as a construction material for purposes other than highway construction and

[4] MYRON H. NAMKEN, engineer, Soil Conservation Service, helped prepare this section.

TABLE 5.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. fully the instructions for referring to other series that appear in the first column

Soil series and map symbols	Hydrologic soil group	Depth		USDA texture	Classification	
		To bedrock or indurated caliche	From surface		Unified	AASHTO
		Feet	*Inches*			
Akela: AG, A K	C	1–1 ½	0–18	Very gravelly loam	GM	A–2, A–1
			18	Basalt.		
*Arizo: AV	A	>5	0–4	Sandy loam	SM	A–2
			4–60	Very gravelly sand	GW	A–1
For Vinton part, see Vinton series.						
*Berino: BA	B	>5	0–5	Loamy sand	SM	A–2
			5–40	Sandy loam, sandy clay loam.	SC	A–6, A–4
			40–60	Loamy sand	SM	A–2
For Mohave part, see Mohave series.						
*Bluepoint: Bd, Be, BG, BO	A	>5	0–60	Loamy fine sand or loamy sand.	SM, SP–SM	A–2, A–3
For Onite part of BO, see Onite series.						
Brenda: B R	C	>5	0–24	Gravelly clay loam	CL	A–6
			24–60	Gravelly coarse sand	SP–SM, SM	A–3, A–2
*Cottonwood: CO	C	½–1	0–8	Sandy loam	SM	A–2, A–4
			8–60	Soft powdery gypsum.		
For Reeves part, see Reeves series.						
*Dona Ana: Da, Dc, Dp	B	>5	0–6	Sandy loam	SM	A–2, A–4
			6–40	Sandy clay loam	SC, CL	A–6, A–7
			40–60	Loamy sand	SP–SM, SM	A–2, A–1
For Pintura part of Dp, see Pintura series.						
*Dune land: DT	A	>5	0–60	Fine sand	SP, SP–SM	A–3
For Pintura part, see Pintura series.						
Eba: Eb, EG	C	>5	0–5	Gravelly clay loam	CL	A–6
			5–60	Very gravelly clay	GC	A–6, A–2
Gila: Ga, Gh, G m	B	>5	0–8	Sandy loam or loam	SM or ML	A–2 or A–4
			8–60	Loam, very fine sandy loam, silt loam, fine sandy loam.	SM or ML	A–4
Graham: G R	D	1–1 ½	0–19	Clay	CH, GC	A–7
			19	Basalt.		
Harkey: Ha, Hh, Hk	B	>5	0–54	Silt loam	CL–ML, ML	A–4
			54–70	Loamy sand	SM	A–1, A–2
*Hondale: Ho, Hr, Hs, HT, HU	D	>5	0–5	Heavy loam or silty clay loam.	ML or CL	A–4 or A–6
			5–35	Clay, clay loam	CL or CH	A–7
			35–60	Heavy loam, sandy clay loam.	CL or SC	A–6
For Mimbres part of HT, see Mimbres series. For Bluepoint part of HU, see Bluepoint series.						
Jal: Ja	B	>5	0–9	Fine sandy loam	SM, ML	A–4
			9–60	Light clay loam	CL, SC, SM–SC	A–6
Karro: Ka	B	>5	0–17	Silty clay loam, clay loam.	CL–ML, CL	A–4, A–6
			17–23	Loam	CL–ML	A–4
			23–60	Loam	CL–ML	A–4
Ledru: LC	D	1–1 ½	0–4	Gravelly clay loam	CL	A–6
			4–17	Silty clay	CH	A–7
			17	Conglomerate.		

significant in engineering

The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow care-of this table. The symbol < means less than; the symbol > means more than]

Fraction greater than 3 inches	Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
					In per hr	*In per in of soil*	*pH*			
15–30	40–50	35–50	35–50	20–35	0.6–2.0	0.08–0.10	7.4–8.4	0–1	Low	High.
---	85–100	80–95	30–40	25–35	2.0–6.0	0.07–0.12	7.4–7.8	0–1	Low	Moderate.
5–20	35–50	25–50	20–30	0–5	>20	0.04–0.06	7.4–7.8	0–1	Low	Low.
---	---	100	50–75	15–30	2.0–6.0	0.06–0.08	7.4–7.8	1–4	Low	High.
---	95–100	95–100	65–80	35–45	0.6–2.0	0.13–0.17	7.4–8.4	1–4	Moderate	High.
---	95–100	95–100	55–75	15–25	2.0–6.0	0.06–0.08	7.9–8.4	1–4	Low	High.
---	90–100	90–100	65–85	5–25	6.0–20	0.06–0.08	7.4–7.8	0–1	Low	Low.
0–10	85–100	70–85	60–80	50–65	0.06–0.20	0.14–0.16	7.4–7.8	1–4	Moderate	High.
0–10	95–100	80–85	50–70	5–15	>20	0.04–0.06	7.9–8.4	1–4	Low	High.
---	100	95–100	55–70	25–40	0.6–2.0	0.08–0.13	7.9–8.4	1–4	Low	High.
---	95–100	95–100	60–70	30–40	2.0–6.0	0.08–0.13	7.4–7.8	1–4	Low	High.
---	95–100	95–100	70–95	35–60	0.6–2.0	0.13–0.17	7.4–8.4	1–4	Moderate	High.
---	90–100	90–100	45–60	10–25	2.0–6.0	0.06–0.08	7.4–8.4	1–4	Low	High.
---	---	100	50–70	0–10	>20	0.04–0.06	7.4–7.8	0–1	Low	Low.
0–15	80–100	70–100	65–90	50–75	0.2–0.6	0.14–0.16	7.4–7.8	1–4	Moderate	High.
10–25	25–60	20–50	20–50	15–45	0.06–0.2	0.07–0.09	7.4–8.4	1–4	Moderate	High.
---	95–100	95–100	65–90	30–60	0.06–6.0	0.08–0.15	7.4–7.8	1–4	Low	High.
---	95–100	95–100	80–90	45–75	0.6–2.0	0.13–0.18	7.4–8.4	1–4	Low	High.
5–25	70–95	60–90	50–80	45–55	0.06–0.2	0.14–0.16	7.4–7.8	1–4	High	High.
---	100	95–100	85–100	75–90	0.2–2.0	0.13–0.17	7.4–7.8	1–4	Low	High.
---	75–100	70–100	40–75	15–35	0.2–2.0	0.07–0.11	7.9–8.4	1–4	Low	High.
---	95–100	95–100	85–95	50–90	0.6–2.0	0.08–0.10	7.9–9.0	4–8	Moderate	High.
---	100	100	85–95	75–95	<0.06	0.07–0.11	8.5–9.0	4–8	High	High.
---	95–100	95–100	80–90	40–65	0.06–0.2	0.07–0.11	8.5–9.0	4–8	Moderate	High.
---	95–100	95–100	70–85	40–55	2.0–6.0	0.08–0.13	7.9–8.4	4–8	Low	High.
---	95–100	95–100	55–75	45–60	0.6–2.0	0.04–0.08	7.9–9.0	4–8	Low	High.
---	95–100	95–100	90–100	70–95	0.2–0.6	0.13–0.17	7.4–8.4	1–4	Moderate	High.
---	95–100	95–100	85–95	50–70	0.6–2.0	0.13–0.17	7.9–8.4	1–4	Low	High.
---	100	95–100	85–95	60–70	0.2–0.6	0.05–0.10	7.9–8.4	4–8	Low	High.
0–5	75–85	70–85	60–80	50–65	0.2–0.6	0.15–0.19	7.4–7.8	1–4	Moderate	High.
0–5	95–100	90–100	85–95	80–90	<0.06	0.15–0.19	7.4–7.8	1–4	Moderate	High.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Depth		USDA texture	Classification	
		To bedrock or indurated caliche	From surface		Unified	AASHTO
		Feet	*Inches*			
Lehmans: LD, LK	C	1–1 ½	0–4	Cobbly loam	SM, ML	A–4
			4–13	Cobbly clay	CH	A–7
			13–18	Cobbly sandy clay loam	SC	A–6, A–2
			18	Acid igneous bedrock.		
Lozier: LM	D	½–1	0–8	Extremely stony loam	GM	A–1, A–2
			8	Limestone.		
Luxor: LU	D	½–1 ½	0–5	Extremely stony sandy loam.	SM	A–2
			5–18	Gravelly clay loam	CL	A–6
			18	Rhyolite.		
Maricopa: Ma, Mah	B	>5	0–22	Sandy loam	SM	A–2
			22–60	Gravelly loamy sand	SM, GP–GM	A–1
*Mimbres:						
Mb	C	>5	0–8	Loam	CL–ML	A–4
			8–40	Silty clay loam	CL	A–7
			40–60	Sandy clay loam	SC	A–6
Mc, MM, Mn, MR	C	>5	0–42	Silty clay loam	CL	A–7
			42–60	Sandy clay loam	SC	A–6
For Verhalen part of MR, see Verhalen series.						
Md	C	>5	0–60	Silty clay loam	CL	A–7
Mimbres variant: Me	C	>5	0–21	Silty clay loam	CL	A–7
			21–36	Loamy sand and sandy loam.	SM	A–2
			36–60	Coarse sand	SM, SP–SM	A–2, A–3
*Mohave:						
Ms, My	B	>5	0–6	Sandy loam	SM	A–2
			6–28	Sandy clay loam	SC, CL	A–6
			28–60	Clay loam	CL	A–6
For Pintura part of Mv, see Pintura series.						
Mt, MU	B	>5	0–28	Sandy clay loam	SM, SC, CL	A–4, A–6
			28–60	Clay loam	CL	A–6
*Nickel: NK, NT	B	>5	0–4	Very gravelly sandy loam	GM	A–1
			4–18	Very gravelly loam	GM	A–2, A–1
			18–60	Cobbly loam	GM	A–2, A–1
For Tres Hermanos part of NT, see Tres Hermanos series						
Onite	B	>5	0–8	Loamy sand	SM	A–2
			8–27	Sandy loam	SM	A–2
			27–60	Gravelly sand and loamy sand.	SP–SM	A–2
Mapped only with Bluepoint soils.						
*Pintura: PB, PS	A	>5	0–60	Fine sand	SP–SM, SM	A–3, A–2
For Berino part of PB, see Berino series. For Simona part of PS, see Simona series.						
Reeves	C	>5	0–20	Loam	ML	A–4
			20–60	Fine powdery gypsum.		
Mapped only with Cottonwood soils.						
Riverwash: RE. No valid estimate can be made.	----------	>5				
Rock land: RO. No valid estimate can be made.	D	0–½				
Rough broken and rock land: RU. No valid estimate can be made.	D					

significant in engineering—Continued

Fraction greater than 3 inches	Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
					In per hr	*In per in of soil*	*pH*			
5–25	75–85	70–85	60–80	40–65	0.6–2.0	0.08–0.13	7.4–7.8	1–4	Low	High.
5–20	80–95	65–90	60–85	55–75	0.06–0.2	0.08–0.13	7.4–7.8	1–4	High	High.
10–25	75–90	60–75	50–65	25–40	0.6–2.0	0.08–0.13	7.4–7.8	1–4	Moderate	High.
25–50	45–70	35–60	30–50	20–40	0.6–2.0	0.03–0.08	7.4–8.4	1–4	Moderate	High.
25–50	80–90	75–85	50–55	25–35	0.6–2.0	0.08–0.13	7.4–7.8	1–4	Low	High.
5–25	80–90	75–85	70–80	50–70	0.06–0.2	0.12–0.14	7.9–8.4	1–4	Moderate	High.
	95–100	95–100	50–65	20–35	2.0–6.0	0.08–0.11	7.4–7.8	1–4	Low	High.
	45–85	35–75	20–55	5–15	6.0–20	0.06–0.08	7.4–8.4	1–4	Low	High.
	100	95–100	80–95	50–60	0.6–2.0	0.13–0.17	7.4–8.4	1–4	Low	High.
	100	100	95–100	80–95	0.2–0.6	0.17–0.19	7.9–8.4	1–4	Moderate	High.
	95–100	95–100	65–80	35–50	0.6–2.0	0.17–0.19	7.4–8.4	1–4	Moderate	High.
	100	100	90–100	75–95	0.2–0.6	0.17–0.19	7.9–8.4	1–4	Moderate	High.
	95–100	95–100	65–80	35–50	0.6–2.0	0.13–0.17	7.4–8.4	1–4	Moderate	High.
	100	100	90–100	75–95	0.06–0.2	0.07–0.11	8.5–9.0	1–4	Moderate	High.
	100	100	90–100	75–95	0.2–0.6	0.17–0.19	7.9–8.4	1–4	Moderate	High.
	80–100	80–100	40–60	20–35	2.0–6.0	0.07–0.13	7.4–8.4	1–4	Low	High.
	100	100	40–60	5–15	>20	0.06–0.08	7.4–8.4	1–4	Low	High.
	95–100	95–100	50–65	20–35	2.0–6.0	0.08–0.13	7.4–7.8	1–4	Low	High.
	95–100	95–100	65–90	35–55	0.6–2.0	0.13–0.17	7.4–8.4	1–4	Moderate	High.
	95–100	95–100	80–100	75–85	0.2–0.6	0.15–0.19	7.9–8.4	1–4	Moderate	High.
	95–100	95–100	70–90	35–55	0.6–2.0	0.13–0.17	7.4–8.4	1–4	Moderate	High.
	95–100	95–100	80–100	75–95	0.2–0.6	0.15–0.19	7.9–8.4	1–4	Moderate	High.
0–15	35–50	35–50	20–35	10–20	6.0–20	0.06–0.08	7.4–8.4	1–4	Low	High.
0–15	35–50	30–45	20–35	15–30	0.2–0.6	0.06–0.10	7.9–8.4	1–4	Low	High.
20–35	45–55	35–50	25–40	20–35	0.6–2.0	0.06–0.10	7.9–8.4	1–4	Low	High.
	90–100	90–100	50–75	15–30	6.0–20	0.06–0.08	7.4–7.8	0–1	Low	Low.
	85–95	80–95	50–60	25–35	2.0–6.0	0.08–0.13	7.4–7.8	0–1	Low	Moderate.
0–10	80–95	70–85	25–40	5–10	>20	0.04–0.06	7.4–8.4	1–4	Low	High.
	95–100	95–100	70–90	5–15	6.0–20	0.04–0.06	7.4–7.8	0–1	Low	Low.
	95–100	95–100	85–95	60–75	0.6–2.0	0.12–0.14	7.9–8.4	1–4	Low	High.

TABLE 5.—*Estimated soil properties*

Soil series and map symbols	Hydrologic soil group	Depth		USDA texture	Classification	
		To bedrock or indurated caliche	From surface		Unified	AASHTO
		Feet	*Inches*			
Simona: SD	D	½–1 ½	0–6	Loamy sand	SM	A–2
			6–18	Sandy loam	SM	A–2
			18	Indurated caliche.		
*Sonoita: Sn, SO, Ss	B	>5	0–42	Heavy sandy loam	SC, SM	A–6, A–4, A–2
For Pintura part of Ss, see Pintura series.			42–60	Gravelly sandy loam	SM	A–2
Stellar: ST, SU, Sw	C	>5	0–3	Silty clay loam	ML	A–4
			3–37	Clay, silty clay	CL, CH	A–7
			37–60	Clay loam or sandy clay loam.	CL, SC	A–6, A–7
Stony land: SX. No valid estimates can be made.						
Tres Hermanos: TH	B	>5	0–6	Gravelly loam	SC	A–4
			6–36	Gravelly clay loam	CL	A–6
			36–60	Very gravelly sandy clay loam.	GP–GC, GC	A–2
*Turney: TU	B	>5	0–3	Fine sandy loam	SM	A–4
For Dona Ana part of TU, see Dona Ana series.			3–35	Heavy loam	CL	A–6
			35–60	Clay loam	CL	A–6
Upton: UG, UP	C	½–1 ½	0–6	Gravelly sandy loam	SM	A–2
			6–13	Gravelly loam	SM	A–4, A–2
			13	Indurated caliche.		
Verhalen:						
Ve	D	>5	0–5	Silty clay loam	ML	A–7
			5–60	Clay or silty clay	CH, MH	A–7
Vh	D	>5	0–5	Silty clay loam	ML	A–7
			5–60	Clay or silty clay	CH, MH	A–7
Vinton	B	>5	0–48	Loamy sand	SM	A–2
Mapped only with Arizo soils.			48–60	Very gravelly sand	GW	A–1
Yturbide: Yt	A	>5	0–16	Loamy sand	SM	A–2
			16–60	Gravelly sand	SW–SM	A–1

maintenance, and as a foundation material. Soils are classified according to particle size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL–ML.

The AASHTO system classifies soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is assigned to one of seven basic groups, ranging from A–1 through A–7, on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils, which have high bearing strength and are the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils, which have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 7. The estimated classification, without group index numbers, is given in table 5 for all soils mapped in the survey area.

Soil properties significant to engineering

Estimates of soil properties significant in engineering are listed in table 5. They are for typical soil

significant in engineering—Continued

Fraction greater than 3 inches	Percentage passing sieve—				Permeability	Available water capacity	Reaction	Salinity	Shrink-swell potential	Risk of corrosion
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
					In per hr	*In per in of soil*	*pH*			
0–5	95–100	90–100	75–85	15–25	6.0–20	0.06–0.08	7.9–8.4	1–4	Low	High.
0–10	90–100	85–100	60–70	25–35	2.0–6.0	0.08–0.13	7.9–8.4	1–4	Low	High.
	80–100	75–100	70–95	30–50	0.6–2.0	0.10–0.13	7.4–8.4	0–1	Low	Moderate.
	70–95	70–90	35–65	20–35	2.0–6.0	0.05–0.10	7.9–8.4	1–4	Low	High.
	100	95–100	90–100	70–95	0.2–0.6	0.15–0.19	7.4–8.4	1–4	Moderate	Moderate.
	100	95–100	95–100	80–95	0.06–0.2	0.13–0.17	7.9–8.4	1–4	High	High.
	75–100	70–100	55–80	35–65	0.2–0.6	0.15–0.19	7.9–8.4	1–4	Moderate	High.
0–5	75–85	70–85	60–75	40–50	0.6–2.0	0.10–0.13	7.4–8.4	1–4	Low	Moderate.
0–5	60–85	55–85	50–80	40–60	0.2–0.6	0.10–0.14	7.9–8.4	1–4	Moderate	High.
5–15	10–40	5–35	5–30	5–20	0.6–2.0	0.06–0.08	7.9–8.4	1–4	Low	High.
	95–100	95–100	65–80	35–50	0.6–2.0	0.13–0.17	7.9–8.4	1–4	Low	High.
	95–100	95–100	80–90	60–70	0.6–2.0	0.15–0.19	7.9–8.4	1–4	Low	High.
	95–100	95–100	85–95	70–80	0.6–2.0	0.02–0.04	7.9–9.0	1–4	Low	High.
0–10	55–75	55–70	25–35	15–25	2.0–6.0	0.07–0.10	7.9–8.4	1–4	Low	High.
0–10	60–80	60–75	50–55	30–35	0.6–2.0	0.08–0.13	7.9–8.4	1–4	Low	High.
	95–100	95–100	80–100	75–95	0.06–0.2	0.13–0.17	7.9–8.4	1–4	Moderate	High.
	95–100	95–100	85–100	80–100	<0.06	0.13–0.17	7.9–8.4	1–4	High	High.
	95–100	95–100	80–100	75–95	<0.06	0.10–0.13	8.5–9.5	4–8	Moderate	High.
	95–100	95–100	85–100	80–100	<0.06	0.10–0.13	8.5–9.5	4–8	High	High.
	95–100	90–100	50–60	10–25	2.0–6.0	0.06–0.08	7.4–7.8	1–4	Low	High.
5–15	35–50	20–25	10–15	0–5	>20	0.04–0.06	7.4–8.4	1–4	Low	High.
	85–100	85–100	60–75	15–25	6.0–20	0.06–0.08	7.4–7.8	1–4	Low	Moderate.
	55–80	50–75	25–30	5–10	>20	0.04–0.06	7.4–7.8	1–4	Low	Low.

profiles, by layers that differ sufficiently to differ significantly in soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 5.

Hydrologic soil groups are used in watershed planning to estimate runoff from rainfall. Considered are soil properties that influence the minimum rate of infiltration obtained on a bare soil after prolonged wetting, for example depth to seasonally high water table, intake rate and permeability after prolonged wetting, and depth to very slowly permeable layer. The influence of ground cover is not considered in the grouping.

The soils are classified as four groups, A through D.

A. Low runoff potential. Soils having high infiltration rates even when thoroughly wetted. Consisting chiefly of deep, well drained to excessively drained sand or gravel. These soils have a high rate of water transmission.

B. Moderately low runoff potential. Soils having moderate infiltration rates when thoroughly wetted. Consisting chiefly of moderately deep to deep, moderately well drained to well drained soils that are moderately fine textured to moderately coarse textured. These soils have a moderate rate of water transmission.

C. Moderately high runoff potential. Soils having slow infiltration rates when thoroughly wetted. Consisting chiefly of soils that have a layer that impedes downward movement of water, soils that are moderately fine textured to fine textured, or soils that have a moderate

TABLE 6.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. fully the instructions for referring to other

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption field	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]	Local roads and streets
Akela: AG, A K	Severe: stony; shallow over basalt.	Severe: steep slopes; stony; shallow over basalt.	Severe: slope; shallow over basalt.	Severe: steep slopes; shallow over basalt.	Severe: shallow over basalt; stones.	Severe: shallow over basalt; some steep slopes.
*Arizo: AV. For Vinton part, see Vinton series.	Slight [2]	Severe: very rapid permeability.	Severe: subject to slumping.	Slight	Slight [2]	Slight
*Berino: BA. For Mohave part, see Mohave series.	Slight to mod-moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Moderate: moderate shrink-swell.	Slight	Moderate: moderate shrink-swell.
*Bluepoint: Bd, Be, BG, BO. For Onite part of BO, see Onite series.	Slight [2]	Severe: rapid permeability.	Severe: loamy sand; subject to slumping.	Slight	Moderate: loamy sand; subject to slumping and soil blowing.	Slight
Brenda: B R	Severe: slope	Severe: slope	Moderate: subject to slumping below a depth of 24 inches.	Moderate to severe: slope; moderate shrink-swell to a depth of 24 inches.	Moderate: clayey material to a depth of 24 inches.	Moderate in upper 24 inches; moderate shrink-swell; slope.
*Cottonwood: CO. For Reeves part, see Reeves series.	Severe: shallow over soft gypsum.	Severe: shallow over soft gypsum; high seepage potential.	Slight	Moderate: shallow over soft gypsum.	Moderate: shallow over soft gypsum.	Moderate: shallow over soft gypsum.
*Dona Ana: Da, Dc, Dp. For Pintura part of Dp, see Pintura series.	Moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Slight to moderate: moderate shrink-swell.	Slight	Moderate: moderate shrink-swell.
*Dune land: DT. For Pintura part, see Pintura series.	Severe: shifting of sand dunes.	Severe: rapid permeability; shifting of sand dunes.	Severe: shifting of sand dunes.	Severe: shifting of sand dunes.	Severe: shifting of sand dunes; subject to slumping.	Severe: shifting of sand dunes.

engineering properties of soils

The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow care-
series that appear in the first column of this table]

Suitability as a source of—			Soil features affecting—				
Road fill	Sand or gravel	Topsoil	Pond reservoir area	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Poor: shallow over basalt.	Unsuited	Poor: shallow over basalt.	Some steep slopes; shallow over basalt.	Shallow over basalt.	Well drained	Some steep slopes; shallow over basalt.	Shallow over basalt; some steep slopes.
Good	Good	Poor: very gravelly.	High seepage potential.	High seepage potential.	Excessively drained.	Rapid infiltration; low available water capacity.	Not suitable for terraces; erosion hazard.
Fair: moderate shrink-swell.	Unsuited	Fair to poor: sandy loam to loamy sand surface layer; low fertility.	Moderate permeability.	Medium to high shear strength; low compressibility; medium to low compacted permeability.	Well drained	Moderate permeability; moderate to severe soil blowing hazard.	Severe soil blowing hazard.
Good	Fair for sand if washed and screened.	Poor: loamy sand; low fertility.	Rapid permeability; subject to severe soil blowing.	Very erodible; fair compaction characteristics; low resistance to piping.	Somewhat excessively drained.	Rapid permeability; low available water capacity.	Very erodible; low resistance to piping.
Fair: slope; moderate shrink-swell to a depth of 24 inches.	Unsuited to a depth of 24 inches; fair below a depth of 24 inches if screened and washed.	Poor to fair: gravelly; slope.	Rapid permeability below a depth of 24 inches; slope.	Slope; low compressibility; rapid permeability; susceptibility to piping below a depth of 24 inches.	Well drained	Slope; gravelly	Slope; coarse-textured material; rapid permeability below a depth of 24 inches.
Fair: shallow over soft gypsum; high risk of corrosion for concrete.	Unsuited	Fair to poor: shallow to very shallow over soft gypsum.	Shallow over soft gypsum; high seepage potential.	Shallow over soft gypsum.	Well drained	Shallow over soft gypsum; very low available water capacity.	Shallow over soft gypsum; high seepage potential.
Fair: moderate shrink-swell.	Unsuited	Fair to poor: sandy clay loam to loamy sand surface; high lime content.	Moderate permeability.	Medium to high shear strength; low compacted permeability.	Well drained	Moderate permeability; moderate to severe soil blowing hazard.	Moderate to severe soil blowing hazard.
Good	Fair for sand if washed and screened.	Poor: loamy sand or sand material; low fertility.	Rapid permeability; subject to severe soil blowing.	Subject to severe soil blowing; fair to poor compaction.	Excessively drained.	Rapid permeability; low available water capacity; low fertility; severe hazard of soil blowing.	Very erodible; low resistance to piping.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption field	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]	Local roads and streets
Eba: Eb, EG	Severe: slow permeability.	Moderate to severe: slope; coarse fragments.	Moderate: scattered cobbles.	Moderate: moderate shrink-swell; scattered cobbles.	Slight	Moderate: moderate shrink-swell.
Gila: Ga, Gh, G m	Slight to mod-moderate: moderate permeability; severe where flooded.	Moderate: moderate: permeability; severe where flooded.	Slight: severe where flooded.	Slight: severe where flooded.	Slight: severe where flooded.	Moderate: ML material; hard to pack; severe where flooded.
Graham: G R	Severe: shallow over basalt.	Severe: shallow over basalt.	Severe: shallow over basalt.	Severe: shallow over basalt; clay subsoil.	Severe: shallow over basalt.	Severe: shallow over basalt; plastic; moderate to high shrink-swell.
Harkey: Ha, Hh, H K	Moderate to severe: moderate to moderately slow permeability; severe where flooded.	Slight to moderate: moderate to moderately slow permeability; severe where flooded.	Slight: severe where flooded.	Slight: severe where flooded.	Slight: severe where flooded.	Moderate: ML or CL material; hard to pack; compressible.
*Hondale: Ho, Hr, Hs, H T, HU. For Mimbres and Bluepoint parts of H T and HU, see their respective series.	Severe: very slow permeability.	Slight	Slight	Severe: high shrink-swell.	Severe: clay underlying strata.	Severe: plastic; high shrink-swell; CL to CH material; hard to pack.
Jal: Ja	Moderate to severe: soft caliche at a depth of 9 inches; moderate permeability.	Severe: soft caliche at a depth of 9 inches, moderate permeability.	Slight	Slight	Moderate: caliche at a depth of 9 inches.	Moderate: unstable material below a depth of 9 inches; hard to pack.
Karro: Ka	Severe: moderate to moderately slow permeability.	Slight	Moderate: weakly cemented caliche at a depth of 23 inches.	Moderate to severe: CL material; moderate shrink-swell.	Slight	Moderate: CL material; hard to pack.

properties of soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand or gravel	Topsoil	Pond reservoir area	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Fair: moderate shrink-swell.	Unsuited	Poor: gravelly clay loam becoming very gravelly clay within 5 inches.	Slow permeability; very gravelly and cobbly subsoil; slope.	Medium to high shear strength; low to medium compressibility; susceptible to piping; good to fair compaction.	Well drained	Severe: very gravelly and cobbly clay within 5 inches; slopes of 0 to 10 percent.	Very gravelly and cobbly subsoil; moderate shrink-swell; slope.
Fair: ML material; hard to pack.	Unsuited	Good	Moderate permeability.	Poor stability; poor compaction; subject to piping.	Well drained	May be subject to flooding in areas; moderate permeability.	Erodible; soil blowing hazard.
Poor: moderate to high shrink-swell; shallow over basalt.	Unsuited	Poor: stony clay at shallow depth; shallow over basalt.	Stony clay material; rolling to hilly; shallow over basalt.	Shallow over basalt; low shear strength; high compressibility; fair to poor compaction.	Well drained	Stony; shallow over basalt; rolling to hilly.	Stony; shallow over basalt; rolling to hilly.
Fair: ML material; hard to pack; compressible.	Unsuited	Good	Moderate to moderately slow permeability.	Poor compaction; subject to piping; medium to low compacted permeability.	Well drained	May be subject to flooding in areas; moderate permeability.	Poor compaction; subject to piping.
Poor: high shrink-swell; CL to CH material; hard to pack.	Unsuited	Poor: alkali affected.	Very slow permeability; slopes of 0 to 3 percent.	Low shear strength; medium compressibility; high piping hazard.	Subject to ponding; very slow permeability.	Alkali	Clayey; high shrink-swell; subject to piping.
Fair: CL material; soft caliche at a depth of 9 inches; hard to pack.	Unsuited	Poor: extra high lime content; low fertility.	Moderate permeability; slopes of 0 to 3 percent.	Medium to low shear strength; piping hazard; medium compressibility; low compacted permeability.	Well drained	High in lime content; low fertility.	Shallow over caliche; soil blowing hazard; difficult to grow plants.
Fair: CL material; moderate shrink-swell; hard to pack.	Unsuited	Fair: limited thickness of usable material.	Moderate to moderately slow permeability; fair to poor stability.	Medium to low shear strength; medium compressibility; low compacted permeability.	Well drained	Moderately deep to high lime zone; moderate to severe soil blowing hazard; moderate to moderately slow permeability.	Moderately deep to caliche; soil blowing hazard; difficult to grow plants.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption field	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]	Local roads and streets
Ledru: LC	Severe: shallow over conglomerate.	Severe: shallow over conglomerate; slopes of 10 to 25 percent.	Severe: shallow over conglomerate; slopes of 10 to 25 percent.	Severe: shallow over conglomerate; slopes of 10 to 25 percent.	Severe: shallow over conglomerate; slopes of 10 to 25 percent.	Severe: shallow over conglomate; slopes of 10 to 25 percent.
Lehmans: LD, LK	Severe: shallow over bedrock.	Severe: stony; shallow over bedrock.	Severe: stony; shallow over bedrock.	Severe: stony; shallow over bedrock.	Severe: shallow over bedrock.	Severe: shallow over bedrock.
Lozier: LM	Severe: shallow over limestone.	Severe: stony; shallow over limestone.	Severe: stony; shallow over limestone.	Severe: stony; shallow over limestone.	Severe: stony; shallow over limestone.	Severe: stony; shallow over limestone.
Luxor: LU	Severe: shallow over rhyolite.	Severe: stony; shallow over rhyolite.	Severe: stony; shallow over rhyolite.	Severe: stony; shallow over rhyolite.	Severe: stony; shallow over rhyolite.	Severe: stony; shallow over rhyolite.
Maricopa: Ma, Mah	Slight	Severe: rapid permeability.	Slight in upper 22 inches; severe below a depth of 22 inches; subject to slumping.	Slight	Moderate: subject to slumping below a depth of 22 inches.	Slight
*Mimbres: Mb, Mc, MM, Mn, MR. For Verhalen part of MR, see Verhalen series	Severe: moderately slow permeability.	Slight if flooding hazard is removed by dikes.	Slight: severe where flooded.	Moderate: moderate shrink-swell.	Moderate: silty clay loam underlying layers; severe where flooded.	Severe: plastic material; unstable.
Md	Severe: slow permeability.	Slight if flooding hazard is removed by dikes.	Slight: severe where flooded.	Moderate: moderate shrink-swell.	Moderate: silty clay loam underlying layers; severe when flooded.	Severe: plastic material; unstable.

properties of soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand or gravel	Topsoil	Pond reservoir area	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Poor: CH material; moderate shrink-swell.	Unsuited	Poor: clayey; shallow over conglomerate; slopes of 10 to 25 percent.	Shallow over conglomerate; slope of 10 to 25 percent.	Medium to low shear strength; medium compressibility; low compacted permeability.	Well drained	Rolling to hilly; shallow over conglomerate; slow permeability.	Rolling to hilly; shallow over conglomerates.
Poor: CH material; stony and rocky; high shrink-swell; shallow over bedrock.	Unsuited	Poor: stony and rocky; clayey; shallow over bedrock; slopes of 0 to 25 percent.	Stony and rocky; shallow over bedrock; slopes of 0 to 25 percent.	Medium to low shear strength; medium compressibility; low compacted permeability.	Well drained	Slopes of 0 to 25 percent; stony and rocky; shallow over bedrock; slow permeability.	Slopes of 0 to 25 percent; shallow over bedrock; stony and rocky.
Poor: stony; shallow over limestone.	Unsuited	Poor: stony; shallow over limestone.	Stony; shallow over limestone.	Stony; shallow over limestone; medium shear strength; low compacted permeability.	Well drained	Stony; shallow over limestone; slopes of 0 to10 percent.	Stony; shallow over limestone.
Poor: stony; shallow over rhyolite.	Unsuited	Poor: stony; shallow over rhyolite.	Stony; shallow over rhyolite.	Stony; shallow over rhyolite; medium to low shear strength; low compacted permeability.	Well drained	Stony; shallow over rhyolite; slopes of 0 to 5 percent.	Stony; shallow over rhyolite.
Good	Poor in upper 22 inches; fine-grained material; good below a depth of 22 inches.	Good in upper 22 inches; poor below a depth of 22 inches.	Moderately rapid permeability; rapid permeability below a depth of 22 inches.	Good compaction; slight compressibility; poor resistance to piping.	Well drained	Rapid permeability; low to moderate available water capacity; severe soil blowing hazard.	Very erodible; low resistance to piping; difficult to grow plants.
Poor: plastic; CL material.	Unsuited	Fair: clayey	Moderately slow permeability.	Medium shear strength; piping hazard; medium compressibility; fair to good compaction.	Well drained	Moderately slow permeability; may be subject to flooding.	Clayey; moderately slow permeability; moderate shrink-swell.
Poor: plastic, CL material hard to pack.	Unsuited	Poor: clayey and alkali affected.	Slow permeability.	Medium shear strength; piping hazard; medium compressibility; fair to good compaction.	Well drained; alkali affected.	Slow permeability; alkali affected.	Clayey; slow permeability; moderate shrink-swell.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption field	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]	Local roads and streets
Mimbres variant: Me	Slight	Slight if not excavated; severe if excavated; moderately rapid to very rapid permeability below a depth of 21 inches.	Slight: severe where flooded.	Moderate: moderate shrink-swell to a depth of 21 inches.	Moderate: sandy underlying layers; subject to slumping below a depth of 21 inches; severe where subject to flooding.	Severe: plastic material; unstable.
*Mohave: Ms, Mt, MU, Mv. For Pintura part of Mv, see Pintura series.	Severe: moderately slow permeability.	Moderate: moderately slow permeability.	Moderate: clay loam material.	Moderate: moderate shrink-swell.	Moderate: clayey material.	Moderate: moderate shrink-swell; SC and CL material.
*Nickel: NK, NT. For Tres Hermanos part of NT, see Tres Hermanos series.	Severe: moderately slow permeability.	Moderate: slopes of 0 to 9 percent.	Slight	Slight	Slight	Slight
Onite. Mapped only with Bluepoint soils.	Slight [2]	Severe: moderately rapid permeability.	Severe: loamy sand; subject to slumping.	Slight	Moderate: subject to slumping.	Slight
*Pintura: PB, PS. For Berino and Simona parts, see their respective series.	Slight [2]	Severe: rapid permeability.	Severe: sand subject to slumping.	Slight	Severe: sand subject to slumping.	Slight
Reeves. Mapped only with Cottonwood soils.	Slight [3]	Moderate [3]: moderate permeability.	Slight	Slight	Slight [3]	Slight
Riverwash: RE	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Severe: floods
Rock land: RO	Severe: depth to limestone.	Severe: slope	Severe: depth to limestone.	Severe: depth to limestone.	Severe: depth to limestone.	Severe: depth to limestone.
Rough broken and rock land: RU.	Severe: slope; depth to bedrock.	Severe: slope	Severe: depth to bedrock.	Severe: slope	Severe: depth to bedrock.	Severe: slope

properties of soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand or gravel	Topsoil	Pond reservoir area	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Poor: plastic material; hard to pack.	Unsuited	Fair: clayey	Moderately slow permeability becoming moderately rapid at a depth of 21 inches.	Medium shear strength; piping hazard; medium compressibility; fair to good compaction.	Well drained	Moderately slow permeability; may be subject to flooding.	Clayey; moderately slow permeability; moderate shrink-swell.
Fair: SC and CL material; moderate shrink-swell.	Unsuited	Fair: sandy loam in upper 5 inches; clayey below a depth of 5 inches.	Moderately slow permeability.	Medium shear strength; fair to good stability and compaction.	Well drained	Moderately slow permeability; moderate soil blowing hazard.	Slopes of 0 to 3 percent; moderate soil blowing hazard; moderately slow permeability.
Good	Unsuited for sand: fine-grained material; fair for gravel if washed and screened.	Poor: excessive coarse fragments.	Moderately slow permeability; slopes of 0 to 9 percent.	High shear strength; fair to good compaction; low compressibility; medium compacted permeability.	Well drained	Low available water capacity; very gravelly; slopes of 0 to 9 percent.	Very gravelly and cobbly; slopes of 0 9 percent.
Good	Fair for sand if washed and screened.	Poor: loamy sand; low fertility.	Moderately rapid permeability; subject to soil blowing.	Very erodible; fair compaction; low resistance to piping.	Well drained	Moderately rapid permeability; low available water capacity; low fertility; severe soil blowing hazard.	Very erodible; low resistance to piping.
Good	Good	Poor for sand: low fertility.	Rapid permeability; subject to severe soil blowing.	Very erodible; low compressibility; medium to high piping hazard; medium shear strength.	Somewhat excessively drained.	Rapid permeability; low available water capacity; low fertility; severe soil blowing hazard.	Very erodible; low resistance to piping.
Poor: soft gypsum.	Unsuited	Fair to poor: soft gypsum.	Moderate permeability over soft gypsum; high seepage potential.	Soft gypsum; piping hazard.	Well drained	Soft gypsum; low available water capacity.	Soft gypsum; high seepage potential.
Fair to good: variable material.	Fair: variable material.	Poor: too sandy.	Seepage	Seepage	Floods	Floods	Floods.
Poor: depth to limestone.	Unsuited	Poor: depth to limestone.	Depth to limestone; slope.	Depth to limestone.	Depth to limestone.	Depth to limestone.	Depth to limestone.
Poor: depth to bedrock.	Unsuited	Poor: depth to bedrock.	Depth to bedrock; slope.	Depth to bedrock.	Depth to bedrock.	Depth to bedrock; slope.	Depth to bedrock; slope.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption field	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill [1]	Local roads and streets
Simona: SD	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Slight: shallow over indurated caliche may create problems in some areas.
*Sonoita: Sn, SO, Ss. For Pintura part of Ss, see Pintura series.	Slight [2]	Moderate: moderate permeability.	Moderate: subject to slumping.	Slight	Slight	Slight
Stellar: ST, SU, Sw	Severe: slow permeability.	Slight	Moderate: heavy clay loam or clay.	Severe: high shrink-swell.	Moderate: clayey material.	Severe: high shrink-swell.
Stony land: SX	Severe: stones.	Severe: stones.	Severe: stones.	Severe: stones.	Severe: stones.	Severe: stones.
Tres Hermanos: TH	Moderate: moderately slow permeability; in upper 36 inches; moderate permeability below a depth of 36 inches.	Moderate: moderately slow permeability; in upper 36 inches: moderate permeability below a depth of 36 inches.	Slight	Moderate: moderate shrink-swell.	Moderate: clayey material in upper 36 inches.	Moderate: moderate shrink-swell.
*Turney: TU. For Dona Ana part, see Dona Ana series.	Moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Moderate: CL material.	Slight	Moderate: CL material.
Upton: UG, UP	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.	Severe: shallow over indurated caliche.

properties of soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand or gravel	Topsoil	Pond reservoir area	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Good: depth of material over indurated caliche may limit some areas.	Unsuited	Poor: loamy sand; low fertility.	Shallow over indurated caliche.	Erodible; good compaction; resistance to piping; shallow over indurated caliche.	Well drained	Shallow over indurated caliche; low available water capacity; soil blowing hazard.	Erodible; low resistance to piping; shallow over indurated caliche.
Good	Fair for sand if washed and screened.	Poor: gravelly sandy loam.	Moderate permeability.	Very erodible; low compressibility; medium to high piping hazard.	Well drained	Moderate permeability; gravelly sandy loam; severe soil blowing hazard.	Very erodible; low resistance to piping.
Poor: CH material.	Unsuited	Poor: too clayey.	Slow permeability.	Medium to low shear strength; medium compressibility; low compacted permeability; high shrink-swell; subject to cracking.	Well drained	Slow permeability; high available water capacity.	Clayey; slow permeability.
Poor: stones.	Unsuited	Poor: stones	Stones and boulders.	Stones and boulders.	Stones	Low available water capacity.	Stones.
Fair: CL material; moderate shrink-swell.	Unsuited	Poor: gravelly material.	Moderately slow permeability in upper 36 inches; moderate permeability below a depth of 36 inches.	High to medium shear strength; low compacted permeability; low compressibility.	Well drained	Gravelly; moderately slow permeability; moderate available water capacity.	Gravelly to very gravelly loam and clay loam; moderately slow permeability.
Fair: CL material.	Unsuited	Fair: high lime content; caliche at a depth of 26 inches.	Moderate permeability.	Medium shear strength; medium compressibility; low compacted permeability; good compaction.	Well drained	Moderate permeability; high lime content; caliche at a depth of 26 inches.	Moderate permeability; difficult to grow plants.
Good: limiting depth.	Good: crushed caliche.	Poor: gravelly material.	Shallow over indurated caliche.	Shallow over indurated caliche; medium shear strength; low compressibility; low compacted permeability; fair compaction.	Well drained	Gravelly; shallow over indurated caliche.	Gravelly; shallow over indurated caliche; difficult to grow plants.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption field	Sewage lagoons	Shallow excavations	Dwellings without basements	Sanitary landfill[1]	Local roads and streets
Verhalen: Ve	Severe: very slow permeability; subject to flooding.	Slight: severe where flooding is a hazard.	Severe: clay material.	Severe: high shrink-swell; subject to flooding.	Severe: clay material; subject to flooding.	Severe: high shrink-swell; hard to pack; compressible.
Vh	Severe: very slow permeability subject to flooding.	Slight: severe where flooding is a hazard.	Severe: clay material.	Severe: high shrink-swell; subject to flooding.	Severe: clay material; subject to flooding.	Severe: high shrink-swell; hard to pack; compressible.
Vinton Mapped only with Arizo soils.	Slight[2]	Severe: moderately rapid permeability.	Severe: loamy sand; subject to slumping.	Slight	Moderate: loamy sand; subject to slumping.	Slight
Yturbide: Yt	Slight[2]	Severe: rapid permeability.	Severe: loamy sand and gravelly sand; subject to slumping.	Slight	Moderate: sand and gravelly sand; subject to slumping and soil blowing.	Slight

[1] Ratings for trench type sanitary landfill.
[2] Rapid permeability; deep to water table; will not pollute underground water sources.

water table. Some of these soils are somewhat poorly drained.

D. High runoff potential. Soils having very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils that have a high swelling potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to bedrock or cemented caliche is distance from the surface of the soil to the upper surface of the rock layer.

Depth from the surface shown for the layers may not be the same as the depths mentioned in the section "Descriptions of the Soils," because layers having similar engineering properties were combined.

Soil texture is described in table 5 in the standard terms used by the Department of Agriculture (*6*). These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Permeability is that quality that enables a soil to transmit water or air. It is estimated on basis of those

properties of soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand or gravel	Topsoil	Pond reservoir area	Embankments, dikes, and levees	Drainage of cropland and pasture	Irrigation	Terraces and diversions
Poor: high shrink-swell; hard to pack; compressible.	Unsuited	Poor: clay material.	Very slow permeability.	Low shear strength; high compressibility; low compacted permeability; fair compaction.	Very slow permeability.	Very slow permeability; susceptible to flooding.	Very slow permeability; subject to flooding.
Poor: high shrink-swell; hard to pack; compressible.	Unsuited	Poor: clay material.	Very slow permeability.	Low shear strength; high compressibility; low compacted permeability; fair compaction.	Very slow permeability; alkali affected.	Very slow permeability; susceptible to flooding; alkali affected.	Very slow permeability; subject to flooding.
Good	Fair for sand if washed and screened.	Poor: loamy sand; low fertility.	Moderately rapid permeability; subject to severe soil blowing.	Very erodible; fair compaction; low resistance to piping.	Well drained	Moderately rapid permeability; available water capacity; low fertility; severe soil blowing hazard.	Very erodible; low resistance to piping.
Good	Fair for sand if washed and screened.	Poor: loamy sand and gravelly sand; low fertility.	Rapid permeability; subject to severe soil blowing.	Very erodible; fair compaction; low resistance to piping.	Excessively drained.	Rapid permeability; low available water capacity; low fertility; severe soil blowing hazard.	Very erodible; low resistance to piping.

[a] Gypsum material with variable permeability, subject to piping, may pollute underground water.

soil characteristics observed in the field, particularly structure and texture. The estimates in table 5 do not take into account lateral seepage or such transient soil features as a plowpan and or a surface crust.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Salinity refers to the amount of soluble salts in the soil. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25° C. Salinity affects the suitability of a soil for crops, the stability when used as construction material, and the risk of corrosion to metals and concrete.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks when dry or swells when wet. The extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

The risk of corrosion, as used in table 5, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of cor-

TABLE 7.—*Engineering*

[Tests performed by the New Mexico State Highway Department in accordance with

Soil name and location	Parent material	New Mexico Report No. 63—	Depth	Mechanical analysis[1] Percentage passing sieve—	
				¾ in	⅜ in
			Inches		
Bluepoint loamy sand, 0 to 3 percent slopes:					
700 feet south, 50 feet east-northeast corner of sec. 9, T. 24 S., R. 9 W. (Modal)	Mixed igneous material (valley fill).	2729	0–6	----------	----------
		2730	6–20	----------	----------
		2731	20–45	100	98
Dona Ana sandy clay loam:					
485 feet north, 165 feet east of southwest corner, NW, ¼sec. 6, T. 24 S., R. 9 W. (Finer texture than modal profile)	Old alluvium (fan).	2732	0–5	----------	----------
		2733	11–23	----------	----------
		2734	41–60	----------	----------
Harkey silt loam:					
100 feet south, 150 feet east of northwest corner, SE1/4SW 1/4 sec. 25, T. 23 S., R. 9 W. (Finer textured than modal profile)	Alluvium (alluvial fan).	2723	0–4	----------	----------
		2724	4–17	----------	----------
		2725	31–45	----------	----------
Hondale loam:					
660 feet north of SE1/4 sec. 7, T. 25 S., R. 6 W. (Modal)	Old alluvium and valley fill material.	2751	0–5	----------	----------
		2752	5–17	----------	----------
		2753	32–39	----------	----------
Jal fine sandy loam:					
50 feet northwest of southeast corner of sec. 1, T. 25 S., R. 11W. (Modal)	Limy sediments and valley fill.	2738	0–4	----------	100
		2739	9–32	----------	----------
Karro silty clay loam:					
400 feet south, 400 feet west of northeast corner of sec. 4, T. 24 S., R. 9 W. (Modal)	Mixed igneous alluvium (valley fill).	2726	0–4	----------	----------
		2728	17–23	----------	----------
Mohave sandy clay loam, 0 to 1 percent slopes:					
southwest corner SE1/4 sec. 2, T. 24 S., R. 11 W. (Modal)	Mixed acid igneous material (valley fill or bolson).	2735	0–8	----------	----------
		2736	22–28	----------	----------
		2737	52–60	----------	----------
Sonoita gravelly sandy loam:					
660 feet south of northeast corner, SE1/4 sec. 23, T. 28 S., R. 8 W. (Modal)	Igneous mixed alluvium (valley fill).	2745	0–5	----------	100
		2746	5–16	----------	----------
		2747	30–45	100	99
Stellar silty clay loam:					
165 feet south of northeast corner, SE1/4 sec. 12, T. 29 S., R. 10 W. (Modal)	Valley fill (fan).	2748	0–3	----------	----------
		2749	3–15	----------	----------
		2750	44–52	100	98
Verhalen silty clay loam, alkali:					
600 feet east of northwest corner, NE1/4 sec. 1, T. 28 S., R. 8 W. (Modal)	Alluvium (valley fill).	2743	0–5	----------	----------
		2744	14–39	----------	----------

[1] Mechanical analyses according to the AASHTO Designation T 88. Results by this procedure frequently may differ somewhat from the results that would have been obtained by the soil survey procedure of the Soil Conservation Service. In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

rosion of uncoated steel is related to such soil properties as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosion on concrete is influenced mainly by the content of sodium or magnesium sulfate, and also by texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A rating of *low* indicates a low probability of soil-induced corrosion damage. A rating of *high* indicates a high probability of damage. Protective measures for steel and more resistant concrete are needed to avoid or minimize damage.

A seasonal high water table is not a problem in Luna County. In a few very small areas within the Mimbres River flood plain in the extreme northern

test data

standard procedures of the American Association of State Highway and Transportation Officials (AASHTO)]

Mechanical analysis[1] Percentage passing sieve—continued				Liquid limit	Plasticity index	Classification	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)			AASHTO[2]	Unified
----------	100	82	21	[3]NP	NP	A-2-4(0)	SM
----------	100	80	21	NP	NP	A-2-4(0)	SM
96	93	68	8	NP	NP	A-3(0)	SP-SM
----------	100	90	34	NP	NP	A-2-4(0)	SM
----------	100	93	57	42	19	A-7-6(8)	CL
----------	100	93	55	34	13	A-6(5)	CL
----------	100	99	96	31	9	A-4(8)	CL-ML
----------	100	99	97	44	14	A-7-5(10)	ML
----------	100	99	95	49	17	A-7-5(13)	ML
----------	100	89	51	NP	NP	A-4(3)	ML
----------	100	94	75	42	19	A-7-6(12)	CL
----------	100	94	80	46	23	A-7-6(14)	CL
98	95	94	90	NP	NP	A-4(8)	ML
----------	100	73	46	37	14	A-6(3)	SM-SC
----------	100	99	94	27	7	A-4(8)	CL-ML
----------	100	93	55	29	9	A-4(4)	CL
----------	100	87	38	NP	NP	A-4(1)	SM
----------	100	85	54	36	15	A-6(6)	CL
----------	100	99	94	40	20	A-6(12)	CL
98	93	67	34	NP	NP	A-2-4(0)	SM
----------	100	93	50	28	10	A-4(5)	SC
98	91	61	36	28	10	A-4(0)	SC
----------	100	95	75	33	7	A-4(8)	ML
----------	100	97	84	44	17	A-7-6(12)	CL-ML
95	87	79	61	46	20	A-7-6(13)	CL-ML
----------	100	99	93	44	15	A-7-6(11)	ML
----------	100	99	96	54	24	A-7-5(16)	MH-CH

[2] Based on AASHTO Designation M 145-49.
[3] NP — Nonplastic.

part of Luna County, the water table rises periodically, but for only very short periods during heavy seasonal runoff.

Engineering interpretations

The estimated interpretations in table 6 are based on the engineering properties of soils shown in table 5, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Luna County. In table 6, ratings summarize the limitations or the suitability of the soils. For drainage of cropland and pasture, irrigation, ponds and reservoirs, embankments, and terraces and diversions, table 6 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are expressed as slight, moderate, and severe. *Slight* means that soil properties are generally favorable for the rated use, or in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* indicates soil properties so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required. *Very severe* indicates one or more soil properties so unfavorable for a particular use that overcoming the limitation is most difficult and costly and is commonly not practical for the rated use.

Soil suitability is expressed as *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 6.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and sides, or embankments, of compacted soil material. It is assumed that the embankment is compacted to medium density and the pond is protected from flooding. Considered are properties that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic matter, and slope. If the floor needs to be leveled, depth to bedrock is important. The soil properties that affect the embankment are the engineering properties of the enbankment material as interpreted from the Unified soil classification and the content of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, as, for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, no rock outcrops or big stones, no flooding, and no high water table.

The dwellings rated in table 6 are no more than three stories high and are supported by foundation footings placed in undisturbed soil. Features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, the hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the ratings in table 6 apply only to a depth of about 6 feet. Therefore, limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 or 15 feet. Every site, however, should be investigated before it is selected.

Local roads and streets, as rated in table 6, have an all-weather surface expected to carry automobile traffic all year. They have a flexible or rigid surface, commonly asphalt or concrete; a subgrade of underlying soil material; and a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement. Roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep. Soil properties that affect design and construction of roads and streets are the load supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material and also the shrink-swell potential indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed for an even grade.

Road fill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and the relative ease of excavating the material at borrow areas.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 6 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account the thickness of overburden, the location of the water table, or other factors that affect mining of the materials. Neither do they indicate quality of the deposit.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material, as in preparing a seedbed, the natural fertility of the material, or the response of plants when fertilizer is applied; and the absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability. Also considered in the ratings is damage that will result at the area from which topsoil is taken.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoirs have low seepage. Seepage is related to permeability and to the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Stones and organic material in the soil are among factors that are unfavorable.

Drainage of cropland and pasture is affected by such soil properties as permeability, texture, and structure; depth to a claypan, rock, or other layers that influence the rate of water movement; depth to the water table; slope and stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil blowing; texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in other layers that restrict movement of water; amount of water held available to plants; need for drainage; and depth to the water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Soil test data

Table 7 contains engineering test data for some of the major soil series in Luna County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Tests to determine liquid limit and plasticity index measure the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a solid to a plastic. If the moisture content is further increased, the material changes from a plastic to a liquid. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic. The liquid limit is the moisture content at which the material changes from a plastic to a liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Formation and Classification of Soils

The pages that follow define the factors of soil formation and tell how they have affected the soils in Luna County. They also explain the current system of soil classification and classify each soil series according to this system.

Factors of Soil Formation

Soil is the product of soil-forming processes acting on accumulated or deposited geologic material. The five important factors in soil formation are time, relief, parent material, climate, and plant and animal life. These factors control the kind of soil-forming processes and the rate at which they progress. All five factors are active in the formation of every soil, though one factor may be more important than the others. In Luna County, the effects of time and relief or parent material are the more important. The effects of climate, plant and animal life and parent material are the greatest at the higher elevations within climatic zone 6.

Time

The kind of horizons and the degree of their development depend in part on the length of time that the other factors are active. The lowest degree of development is in soils that have formed in recent water deposits or alluvium. Harkey and Arizo soils are examples. These soils are receiving or have received in recent years sediments from the films of sheet water that have spread over the area. The sediments are carried by drainage channels from the adjoining steeper slopes. Organic matter has accumulated in the surface layer. Differentiation of subsurface horizons is weakly expressed.

Berino and the Mohave soils are on older alluvial fans or intermountain valley-fill materials. These soils are older and the horizons are better expressed. They have an A horizon, a well-defined B2t horizon that has more clay than the A horizon, and a horizon of precipitated lime within 3 feet of the surface. The accumulation of lime and clay content in the B2t horizon indicate that these soils are older than the more recently deposited alluvium.

The soils derived from limestone or high lime alluvial materials formed more slowly than other soils in the county. More time is needed to develop horizonal differences in soils where the parent material is high in lime.

Relief

Relief, or lay of the land, influences soil formation through its effect on moisture, temperature, and erosion. Differences in elevation and aspect are associated with differences in climate and vegetation. Generally the deeper, more strongly defined soils are in areas of gentle topography where runoff is slower and the loss of soil through erosion is less. Stellar or Mohave soils are examples. The shallower, less strongly defined Simona and Upton soils are more sloping. The erosion hazard is greater and the surface soil is removed faster by erosion.

Northern and southern exposures differ in their effects on soil formation in Luna County, particularly at the higher elevations and on steep slopes. The soils on north-facing slopes have a darker, thicker A1

horizon than the soils on the south-facing slopes. The Ledru soils on the northern exposures and the Lehmans on the southern exposures are examples. Most mountainous areas are listed as Rough broken land or Rock land. The effects of exposure are noticeable in the small areas of unclassified soils in these areas. Elevation ranges from 4,500 to 6,000 feet. At lower elevations and more gentle topography, differences in aspect have much less effect on soil development.

Parent material

Mixed igneous and sedimentary rocks, mostly limestone, have contributed parent material for the soils of Luna County. The soils on hills and mountainsides formed in residuum weathered from various kinds of rocks. The valley-fill and terrace soils formed in mixed sediments that originated in alluvium and from rocks and soils of the foothills and mountains. Dust from adjacent arid areas has been deposited by wind, and has influenced the soils somewhat.

Limestone or materials high in content of lime have a strong influence on the formation of soils. Lozier soils formed in limestone. Generally they have more lime in the profile and have weakly expressed horizons. Igneous rocks are a source of parent material for Lehmans and Luxor soils. These soils have well-expressed horizons.

Old alluvial sediments on the intermountain valley fill contain a mixture of parent material that varies widely in composition and texture. Sediments derived from acid igneous sources are coarser textured than those derived from limestone.

Climate

The climate of Luna County is arid continental. It is characterized by large annual temperature ranges and distinct seasons. Spring and fall are warm and dry. Summers are hot. Moderate amounts of precipitation fall during thunderstorms. Winters are mild. The precipitation is light showers and snow. Because of high temperatures and low humidity, evaporation rates are high. The soils are not leached of the basic elements because of the low amounts of rainfall. As a result, the soils of Luna County have a high base saturation. Many soils show evidence of leaching and redepositing of lime. The Mohave, Eba, and Stellar soils are examples. They are free of lime in the upper part of the profile, but have accumulations of lime in the lower part of the Bca horizon or in the Cca horizon. These soils also show evidence of translocated clay from the A horizon into the Bt horizon.

Wetting and drying, freezing and thawing, and the depth to which the soils are wet influence the degree of development of soil horizons. The effects of these actions are modified by other soil-forming factors. The presence and depth of lime accumulation in many of the soils indicate the average depth to which water moves. Fine-textured soils generally have a lime zone at a shallower depth than medium-textured soils because the water does not penetrate so deep. Coarse-textured soils or soils in swales, where they receive runoff from surrounding areas, may not have a noticeable zone of lime, but soils formed in very limy materials may be limy at the surface. Karro soils are examples.

Plant and animal life

Plants and animals, including micro-organisms, that live in and on the soil are important in soil formation. The plants are trees, shrubs, and grasses; the animals are earthworms, gophers, badgers, and other burrowing animals; and micro-organisms are fungi, algae, bacteria, and other microscopic plants and animals. By introducing grazing animals, man has reduced the amount of vegetation and thus gradually decreased the amount of organic matter in the soil. The activity of living organisms and animals in the soil increase the water intake rate and the depth to which moisture penetrates. Micro-organisms decompose organic matter and release plant nutrients for use by the plants.

Soils at higher elevations in Luna County have a darker colored surface layer than soils at lower elevations because soils at higher elevations receive more precipitation and support more plant life. Brenda, Graham, and Ledru soils are examples of soils at higher elevations that have a darker colored surface layer.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and range; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*5*). Readers interested in further details about the system should refer to the latest literature available.

The current system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the differentiae used as a basis for classification are soil properties that can be observed in the field, or that can be inferred either from other properties that are observable in the field, or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or that affect soil genesis. In table 8 the soil series of Luna County are classified according to the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. The differentiae for the orders are based on the kind and degree of the dominant sets of soil-forming processes. Each order is identified by a word of three or four syllables ending in *sol*. An example is Aridisol.

SUBORDER.—Each order is divided into suborders that are based primarily on properties that influence

TABLE 8.—*Soil series classification*

Series	Family	Subgroup	Order
Akela	Loamy-skeletal, mixed (calcareous), thermic	Lithic Torriorthents	Entisols.
Arizo	Sandy-skeletal, mixed thermic	Typic Torriorthents	Entisols.
Berino	Fine-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Bluepoint	Mixed, thermic	Typic Torripsamments	Entisols.
Brenda	Fine-loamy over sandy or sandy-skeletal, mixed, thermic.	Aridic Argiustolls	Mollisols.
Cottonwood	Loamy, mixed (calcareous), thermic shallow	Ustic Torriorthents	Entisols.
Dona Ana	Fine-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Eba	Clayey-skeletal, mixed, thermic	Typic Haplargids	Aridisols.
Gila	Coarse-loamy, mixed (calcareous), thermic	Typic Torrifluvents	Entisols.
Graham	Clayey, montmorillonitic, thermic	Lithic Argiustolls	Mollisols.
Harkey	Coarse-silty, mixed (calcareous), thermic	Typic Torrifluvents	Entisols.
Hondale	Fine, mixed thermic	Typic Natrargids	Ardisols.
Jal	Fine-loamy, carbonatic, thermic	Typic Calciorthids	Aridisols.
Karro	Fine-loamy, carbonatic, thermic	Ustollic Calciorthids	Aridisols.
Ledru	Clayey, mixed, thermic	Lithic Arguistolls	Mollisols.
Lehmans	Clayey, montmorillonitic, thermic	Lithic Haplargids	Aridisols.
Lozier	Loamy-skeletal, carbonatic, thermic	Lithic Calciorthids	Aridisols.
Luxor	Loamy, mixed, thermic	Lithic Haplargids	Aridisols.
Maricopa	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), thermic.	Typic Torrifluvents	Entisols.
Mimbres	Fine-silty, mixed, thermic	Typic Camborthids	Aridisols.
Mimbres variant	Fine-silty over sandy or sandy-skeletal, mixed, thermic.	Typic Camborthids	Aridisols.
Mohave	Fine-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Nickel	Loamy-skeletal, mixed, thermic	Typic Calciorthids	Aridisols.
Onite	Coarse-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Pintura	Mixed, thermic	Typic Torripsamments	Entisols.
Reeves	Fine-loamy, gypsic, thermic	Typic Gypsiorthids	Aridisols.
Simona	Loamy, mixed, thermic, shallow	Typic Paleorthids	Aridisols.
Sonoita	Coarse-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Stellar	Fine, mixed, thermic	Ustollic Haplargids	Aridisols.
Tres Hermanos	Fine-loamy, mixed, thermic	Typic Haplargids	Aridisols.
Turney	Fine-loamy, mixed, thermic	Typic Calciorthids	Aridisols.
Upton	Loamy, carbonatic, thermic, shallow	Typic Paleorthids	Aridisols.
Verhalen	Fine, montmorillonitic, thermic	Mollic Torrerts	Vertisols.
Vinton	Sandy, mixed, thermic	Typic Torrifluvents	Entisols.
Yturbide	Mixed, thermic	Typic Torripsamments	Entisols.

soil genesis and that are important to plant growth. The names of suborders have two syllables. The last syllable indicates the order. An example is Orthid (*Orth,* meaning common, plus *id,* from Aridisol).

GREAT GROUP.—Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons, soil moisture and temperature regimes, and base status. The names of great groups have three or four syllables and end with the name of a suborder. A prefix added to the name suggests something about the properties and soil. An example is Calciorthid (*Calc,* meaning calcium carbonate plus *orthid,* the suborder of Aridisols that have a calcic horizon).

SUBGROUPS.—A great group is divided into three kinds of subgroups: the central (typic) concept of the great groups (not necessarily the most extensive subgroup); the intergrades, or transitional forms to other orders, suborders, or great groups; and extragrade subgroups that have some properties that are representative of the great groups but that do not indicate transitions to any other known kind of soil. The word "Typic," for example, before the name of a great group identifies the subgroup that typifies the great group. An example is Typic Calciorthid.

FAMILY.—A soil family is established within a subgroup. These soils have similar physical and chemical properties and the response to management is nearly the same for comparable phases. Among the properties considered are particle-size distribution, kinds of minerals, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for particle-size, kinds of minerals, reaction, and so on, that are used as family differentiae (see table 8). An example is Typic Calciorthids, loamy-skeletal, mixed, thermic.

General Nature of the Area

This part of the survey was prepared mainly for those who want general information about Luna County. The following pages describe the physiography, relief, and drainage of the county; the geology; the climate; and transportation facilities.

Physiography, Relief, and Drainage

Luna County is in the southwestern part of New Mexico. It is bordered on the west by Grant and Hidalgo Counties, on the north by Grant and Sierra Counties, on the east by Dona Ana County, and on the south by the State of Chihuahua of the Republic of Mexico. It is traversed from north to south by the Mimbres River, the only important stream in the county. The Mimbres becomes a subsurface stream just north of Deming. It flows at the surface only during periods of exceptional rainfall. The Palomas Arroyo drains the central and western part of the county.

The streams of Luna County flow only during times of heavy downpour, and these are of short duration. The Mimbres River has reached a crest of 10 to 15 feet. At times it overflows the lower lands adjoining its channel. Most of the water goes into the ground and helps greatly in recharging the underground basin. Not since 1906 has the river flowed as far south as the Mexican border.

There are several springs in the county. The most notable are Cow Springs, Willow Springs, and Fort Cummings Springs. The latter is located on the Butterfield Trail just west of old Fort Cummings.

The mountain ranges generally are oriented north-south. The dominant ones are Cooks' Range, culminating in Cooks' Peak, the highest in the county; the Florida Mountains southeast of Deming; the Tres Hermanos Mountains in the southcentral part; the Cedar Mountains in the southwest; and the Goodsight Mountains in the northeast. Smaller mountain peaks are the Victorio Mountains south of Gage and the Grandmother Hills north of Gage. Red Mountain and Black Mountain are two small but prominent buttes. Red Mountain is southwest of Deming, and Black Mountain is northwest of Deming. The area between these mountain ranges is generally level, with gradual slopes to the southeast. Elevations in the county range from 8,408 feet on Cooks' Peak to about 3,900 feet along the Mexican border.

Geology

Four major geomorphic areas in Luna County greatly influence the kinds of soil (*2*). These major subdivisions are mountain uplands, piedmont slopes, basin floors, and a belt of windblown (eolian) sand.

Scattered mountain ranges, peaks, ridges, and hills form the upland part of the county. A large variety of bedrock is exposed in the upland areas. The sedimentary rocks are dominantly limestone and some sandstone and shale. Acid to intermediate igneous intrusive and metamorphic rocks are mainly granite, granodiorite, monzonite, gneiss, schist, and quartzite. Volcanic rocks are acid, intermediate, and basic in composition. They are mainly andesite, latite, rhyolite, and basalt flows and tuff.

Shallow gravelly or stony soils form in volcanic rock material. Lozier and Lehmans soils are typical.

The mountainous areas of Luna County are surrounded by belts of varying widths. The belts comprise several ages of eroded erosional surfaces that slope toward the relatively flat floors of broad intermountain basins. They are the piedmont slopes. Soil characteristics on the piedmont slopes are influenced by the kind of parent rock, the age and stability of the surface, and the percent slope. Typical of these areas are Nickel and Luxor soils.

The bolson, or floor of the basin, shows evidence of several ages of alluvial deposition near the mouth of the Mimbres River system. The bolson is a broad, nearly level area that occupies most of Luna County. The porous formation of the valley fill forms a large underground reservoir in which water has been stored through geologic time.

This water supply is used for irrigation in Luna County. It is in transient storage while it moves very slowly southward into Mexico where it discharges into the Palomas lakes. Depth to the bolson varies, but is known to be at least 4,000 feet in some areas.

Deming and adjoining areas have excellent quality water for commercial and household use.

Soils that form in this area are influenced by the mineralogy, texture, and structural properties of the parent material; the age of the various basin floor surfaces and deposits; and the effect of past flooding or of a high water table. Typical of this area are Hondale and Mimbres soils.

A narrow north-south oriented belt of windblown sand occupies the transition zone between the basin floor and the piedmont slopes in the southeastern part of the county. The fact that this strip of sand is on the lee side of the lowest part of the bolson floor suggests that it could have been removed from the basin floor and then redeposited. Dune land-Pintura complex formed in this material.

Climate [5]

Temperature and precipitation records for Deming, New Mexico, in the center of Luna County, are summarized in table 9. They are representative of most of the county. The average annual precipitation ranges from about 8 to 10 inches. It is probably somewhat higher in the mountains. More than 50 percent of the annual total falls during July, August, and September, mostly during brief but occasionally heavy showers and thunderstorms. During 1958, the most recent year of heavy rainfall, total rainfall was 17 to 20 inches. In 1956, a dry year, total rainfall was 2 to 4 inches.

Average annual snowfall ranges from 1 to 4 inches at reporting stations in the county. Greater totals are likely in the higher mountain areas. Ground cover seldom lasts for more than brief periods.

The average annual maximum temperature in the county is 76° to 77° F. Average annual minimum temperature range from 42° in the north and west to 48° at the lower elevations in the south. Temperatures in the mountainous areas may be expected to average a few degrees lower. The maximum temperature in Luna County was 111° at Gage, on June 24–26, 1924. The minimum recorded temperature in Luna County was −15° at Florida, January 11, 1962. Below zero readings are rare; they have occurred only seven times in 67 years at Deming. Daytime temperatures of 90° or above may be expected to occur on 80 percent of the days in June, July, and August, and minimum temperatures of 32° or below on 80 percent of the days in December and January.

Probabilities of selected threshold temperatures occurring by selected dates in spring and fall at Columbus are shown in table 10. A few days difference in the dates of these threshold temperature occurrences may be expected at other county locations because of differences in elevation and air drainage, particularly for the lower temperatures that do not occur every year. The average freeze-free season is more than 6 months, extending from mid-April until November.

Wind direction is dominantly westerly in all seasons. Less than 3 percent of the time the hourly windspeed exceeds 24 miles per hour. Most of this increased windspeed is from the west quadrant and contributes to blowing dust in spring. Approximately one-fifth of the time the windspeed is less than 4 miles per hour. Winds are lightest in the fall when they average 7 miles per

[5] Prepared by FRANK E. HOUGHTON, National Oceanic and Atmospheric Administration, climatologist for New Mexico.

TABLE 9.—*Temperature and precipitation*

[Data recorded at Deming, New Mexico, for the period 1931–60]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—[1]		Average monthly total	One year in 10 will have—		Average number of days with precipitation of—	
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—	0.10 inch or more	0.25 inch or more
	°F	°F	°F	°F	Inches	Inches	Inches		
January	55	26	69	14	0.4	([2])	1.1	2	1
February	61	29	74	17	.6	([2])	1.3	2	1
March	67	34	79	24	.3	([2])	.7	1	([3])
April	77	42	89	31	.3	([2])	1.1	1	([3])
May	85	49	96	39	.3	([2])	.9	1	([3])
June	95	60	103	50	.5	([2])	1.0	1	1
July	95	66	103	59	1.6	0.6	3.0	4	
August	93	64	100	59	1.6	.3	3.0	4	2
September	88	57	97	48	1.3	([2])	3.5	3	2
October	78	46	89	34	.8	([2])	1.8	2	1
November	65	33	76	20	.3	([2])	.6	1	([3])
December	57	27	69	16	.6	([2])	1.1	2	1
Year	76	44	[4]105	[5]9	8.6	5.3	12.0	24	11

[1] Based on data for period 1933–1958.
[2] 0.005 inch, the smallest measurable amount.
[3] Less than 0.5 day.
[4] Average annual highest temperature.
[5] Average annual lowest temperature.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data recorded at Columbus, Luna County, New Mexico for the period 1951–70]

Probability	Dates for given probability and temperature						
	16°F or lower	20°F or lower	24°F or lower	28°F or lower	32°F or lower	36°F or lower	40°F or lower
Spring:							
1 year in 10 later than	March 11	March 26	April 6	April 11	April 23	May 3	May 14
2 years in 10 later than	March 2	March 19	March 31	April 7	April 18	April 29	May 10
5 years in 10 later than	February 12	March 3	March 16	March 28	April 8	April 20	April 30
Fall:							
1 year in 10 earlier than	November 21	November 10	November 4	October 26	October 22	October 15	October 5
2 years in 10 earlier than	November 27	November 14	November 9	October 31	October 25	October 19	October 9
5 years in 10 earlier than	December 10	November 22	November 18	November 6	November 2	October 25	October 17

hour and strongest in spring when they average 11.3 miles per hour. No tornadoes have been reported.

The amount of evaporation during the month was measured at the Florida, New Mexico, weather station and averaged for the period 1936 to 1963. Monthly averages were as follows:

January 3.72 inches	July 12.30 inches
February 4.89 inches	August 10.23 inches
March 8.33 inches	September 8.83 inches
April 10.84 inches	October 6.55 inches
May 13.42 inches	November 4.53 inches
June 15.14 inches	December 3.41 inches

This annual average of 102.49 inches is equivalent to approximately 66 inches of evaporation from a lake surface. During approximately two-thirds of the years, evaporation from a Class A pan may be expected to measure 95 to 109 inches.

In other parts of Luna County, evaporation may be expected to average 2 inches less per year in the northwest than in Florida and 2 inches more a year in the southeast.

Although measurements of sunshine duration are not made in Luna County, estimates may be made from observations in surrounding areas. Sunshine is plentiful. The nearly 3,600 hours of sunshine received by the county annually is approximately 83 percent of the possible amount. This ranges from nearly 75 percent of possible hours of sunshine during the rainy season and mid-winter, to nearly 90 percent in June.

Relative humidity averages almost 40 percent annually, and is lowest in the spring and early summer months. Generally, the humidity averages nearly 60 percent in the morning and nearly 30 percent in the afternoon. In spring and early in summer, the afternoon humidity is frequently between 15 percent and 25 percent, and occasionally as low as 5 percent.

Transportation

Luna County has adequate transportation facilities. Interstate Highway 10 crosses the county from east to west, and, in addition, all-weather roads extend from Deming south to Columbus and into Chihuahua, Mexico; northwest toward Silver City, New Mexico; and northeast to Hatch, New Mexico. Several other points are easily accessible. The Southern Pacific Railroad crosses the county east and west while the Atchison-Topeka and Santa Fe line runs from Deming northwest towards Silver City and northeast to Hatch, New Mexico, and the Rio Grande Valley.

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(8) United States Department of Defense. 1968. Unified soil classification system for roads, airfields, embankments and foundations. MIL–STD–619B, 30 pp., illus.

Glossary

Air-dry. To dry or dehumidify forage, hay, wood, etc., by means of natural air movement.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. Ratings are high, more than 7.5 inches; moderate, 5 to 7.5 inches; low, 2.5 to 5.0 inches; and very low, less than 2.5 inches.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Buried soil. A developed soil, once exposed but now overlain by more recently formed soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperate areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Coarse-textured soil. Sand and loamy sand.

Cobblestone. A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fine-textured soils. *Moderately fine textured*: Clay loam, sandy clay loam, silty clay loam; *Fine-textured*: sandy clay, silty clay, and clay. Roughly, soil that contains 35 percent or more of clay.

Gravel. Rounded or angular rock fragments that are not prominently flattened and are as much as 3 inches in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Igneous rock. Rock that has been formed by the cooling of molten mineral material. Examples: Granite, syenite, diorite, and gabbro.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Medium-textured soil. Soil of very fine sandy loam, loam, silt loam, or silt.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Slope. The gradient, shape, length, and pattern of soil. Slope is single or complex, and is classisifed as follows:

Percent	*Single*	*Complex*
0 to 1	Level	Nearly level
1 to 3	Nearly level	Gently undulating
3 to 5	Gently sloping	Undulating
5 to 9	Moderately sloping	Gently rolling
9 to 15	Strongly sloping	Rolling
15 to 30	Moderately steep	Hilly
30 to 50	Steep	Steep
50 to 80	Very steep	Very steep

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stones. Rock fragments greater than 10 inches in diameter if rounded, and greater than 15 inches along the longer axis if flat.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles) adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon; has no depth limit.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Map symbol[1/] High Intensity	Map symbol[1/] Low Intensity	Mapping unit	Page	Irrigated capability unit Symbol	Irrigated capability unit Page	Dryland capability subclass Symbol	Range site Name	Range site Page
--	AG	Akela very gravelly loam, 0 to 10 percent slopes	7	-------	--	VIIs	Malpais	45
--	AK	Akela very gravelly loam, 10 to 25 percent slopes	8	-------	--	VIIe	Breaks	43
--	AV	Arizo and Vinton soils	8	-------	--	VIIe	----------	--
		Arizo part	--	-------	--	----	Gravelly	44
		Vinton part	--	-------	--	----	Deep Sand	43
--	BA	Berino and Mohave soils	9	-------	--	VIIe	Sandy	46
Bd		Bluepoint loamy sand, 0 to 3 percent slopes	9	IIIe-11	38	VIIe	Deep Sand	43
Be	--	Bluepoint loamy sand, 0 to 3 percent slopes, hummocky	9	IIIe-11	38	VIIe	Sand Hills	46
--	BG	Bluepoint loamy sand, 3 to 10 percent slopes	9	-------	--	VIIe	Deep Sand	43
--	BO	Bluepoint-Onite association	9	-------	--	VIIe	Deep Sand	43
--	BR	Brenda gravelly clay loam, 10 to 25 percent slopes	10	-------	--	VIIe	Clayey	43
--	CO	Cottonwood and Reeves sandy loams	10	-------	--	VIIs	Gyp Flats	44
Da	--	Dona Ana sandy loam	11	IIe-2	38	VIIe	Sandy	46
Dc	--	Dona Ana sandy clay loam	11	IIs-4	38	VIIe	Loamy	45
Dp	--	Dona Ana-Pintura complex, eroded	11	IVe-11	39	VIIe	----------	--
		Dona Ana part	--	-------	--	----	Sandy	46
		Pintura part	--	-------	--	----	Sand Hills	46
--	DT	Dune land-Pintura complex	12	-------	--	VIIIe	Sand Hills	46
Eb	EG	Eba very gravelly clay loam, 0 to 10 percent slopes	13	-------	--	VIIe	Gravelly	44
Ga	--	Gila sandy loam	13	IIe-2	38	VIIe	Sandy	46
Gh	--	Gila sandy loam, hummocky	13	IIe-2	38	VIIe	Sand Hills	46
Gm	--	Gila loam	13	I-1	38	VIIc	Bottomland	43
--	GR	Graham rocky clay loam, 10 to 25 percent slopes	14	-------	--	VIIs	Breaks	43
Ha	--	Harkey sandy loam	14	IIe-2	38	VIIe	Bottomland	43
Hh	--	Harkey loam, hummocky	14	IIe-2	38	VIIe	Sand Hills	46
Hk	--	Harkey silt loam	15	I-1	38	VIIc	Bottomland	43
Ho	--	Hondale loam	15	IVs-11	40	VIIs	Salt Flats	45
Hr	--	Hondale soils, strongly alkali	15	-------	--	VIIs	Salt Flats	45
Hs	--	Hondale soils, eroded	15	-------	--	VIIe	Salt Flats	45
--	HT	Hondale-Mimbres complex	16	-------	--	VIIs	Salt Flats	45
--	HU	Hondale-Bluepoint association	16	-------	--	----	----------	--
		Hondale part	--	-------	--	VIIs	Salt Flats	45
		Bluepoint part	--	-------	--	VIIe	Sand Hills	46
Ja	--	Jal fine sandy loam	17	IIIs-7	39	VIIs	Limy	45
Ka	--	Karro silty clay loam	18	IIIs-7	39	VIIs	Limy	45
--	LC	Ledru gravelly clay loam, 10 to 25 percent slopes	18	-------	--	VIIe	Hills	44
--	LD	Lehmans very rocky loam, 0 to 10 percent slopes	19	-------	--	VIIs	Shallow	46
--	LK	Lehmans extremely rocky loam, 10 to 25 percent slopes	19	-------	--	VIIs	Hills	44
--	LM	Lozier extremely rocky loam, 0 to 10 percent slopes	19	-------	--	VIIs	Limestone Hills	44
--	LU	Luxor extremely stony sandy loam	21	-------	--	VIIs	Shallow	46
Ma	--	Maricopa sandy loam	22	IIIe-11	38	VIIe	Sandy	46
Mah	--	Maricopa sandy loam, hummocky	22	IIIe-11	38	VIIe	Sand Hills	46
Mb	--	Mimbres loam	22	I-1	38	VIIc	Loamy	45
Mc	--	Mimbres silty clay loam	22	I-1	38	VIIc	Clayey	43

GUIDE TO MAPPING UNITS--Continued

Map symbol[1/] High Intensity	Map symbol[1/] Low Intensity	Mapping unit	Page	Irrigated capability unit Symbol	Irrigated capability unit Page	Dryland capability subclass Symbol	Range site Name	Range site Page
Md	--	Mimbres silty clay loam, alkali-------	23	IVs-10	39	VIIs	Salt Flats	45
Me	--	Mimbres silty clay loam, sandy subsoil variant----------	24	IIs-4	38	VIIs	Clayey	43
--	MM	Mimbres soils----------	23	------	--	VIIc	Clayey	43
Mn	--	Mimbres soils, eroded----------	23	------	--	VIIe	Sand Hills	46
--	MR	Mimbres and Verhalen soils----------	23	------	--	-----	Bottomland	43
		Mimbres part----------	--	------	--	VIIc	----------	--
		Verhalen part----------	--	------	--	VIIs	----------	--
Ms	--	Mohave sandy loam, 0 to 1 percent slopes----------	24	IIe-2	38	VIIe	Sandy	46
Mt	--	Mohave sandy clay loam, 0 to 1 percent slopes----------	24	I-1	38	VIIc	Loamy	45
--	MU	Mohave sandy clay loam, 0 to 3 percent slopes----------	25	------	--	VIIc	Loamy	45
Mv	--	Mohave-Pintura complex, eroded--------	25	IVe-11	39	VIIe	----------	--
		Mohave part----------	--	-------	--	----	Sandy	46
		Pintura part----------	--	-------	--	-----	Sand Hills	46
--	NK	Nickel very gravelly sandy loam, 3 to 9 percent slopes----------	25	-------	--	VIIs	Limy	45
--	NT	Nickel-Tres Hermanos complex----------	26	-------	--	VIIs	Limy	45
--	PB	Pintura-Berino complex, eroded--------	26	-------	--	VIIe	----------	--
		Pintura part----------	--	-------	--	-----	Sand Hills	46
		Berino part----------	--	-------	--	-----	Sandy	46
--	PS	Pintura-Simona complex, eroded--------	26	-------	--	VIIe	----------	--
		Pintura part----------	--	-------	--	-----	Sand Hills	46
		Simona part----------	--	-------	--	-----	Shallow	46
--	RE	Riverwash----------	27	-------	--	VIIIw	----------	--
--	RO	Rock land----------	27	-------	--	VIIs	Limestone Hills	44
--	RU	Rough broken and rock land----------	27	-------	--	VIIs	Hills	44
--	SD	Simona loamy sand, 0 to 5 percent slopes----------	28	-------	--	VIIe	Shallow	46
Sn	SO	Sonoita gravelly sandy loam----------	29	IIe-2	38	VIIe	Sandy	46
Ss	--	Sonoita-Pintura complex, eroded-------	29	IVe-11	39	VIIe	----------	--
		Sonoita part----------	--	-------	--	-----	Sandy	46
		Pintura part----------	--	-------	--	-----	Sand Hills	46
--	ST	Stellar sandy loam----------	30	-------	--	VIIe	Sandy	46
--	SU	Stellar silty clay loam----------	30	-------	--	VIIs	Clayey	43
Sw	--	Stellar silty clay loam, 0 to 1 percent slopes----------	31	IIs-1	38	VIIs	Clayey	43
--	SX	Stony land----------	31	-------	--	VIIs	Hills	44
--	TH	Tres Hermanos gravelly loam, 1 to 5 percent slopes----------	31	-------	--	VIIs	Limy	45
--	TU	Turney-Dona Ana association----------	32	-------	--	VIIe	----------	--
		Turney part----------	--	-------	--	-----	Limy	45
		Dona Ana part----------	--	-------	--	-----	Sandy	46
--	UG	Upton gravelly sandy loam, 3 to 10 percent slopes----------	32	-------	--	VIIs	Limy	45
--	UP	Upton gravelly loam, 0 to 10 percent slopes----------	33	-------	--	VIIs	Limy	45
Ve	--	Verhalen silty clay loam----------	33	IIIs-1	39	VIIs	Bottomland	43
Vh	--	Verhalen silty clay loam, alkali------	33	IVs-11	40	VIIs	Salty Bottomland	45
Yt	--	Yturbide loamy sand----------	34	IVe-11	39	VIIe	Deep Sand	43

[1/] The composition of the mapping units in the low intensity survey is more variable than that in the high intensity survey, but it has been controlled well enough to interpret for the expected use of the soils.

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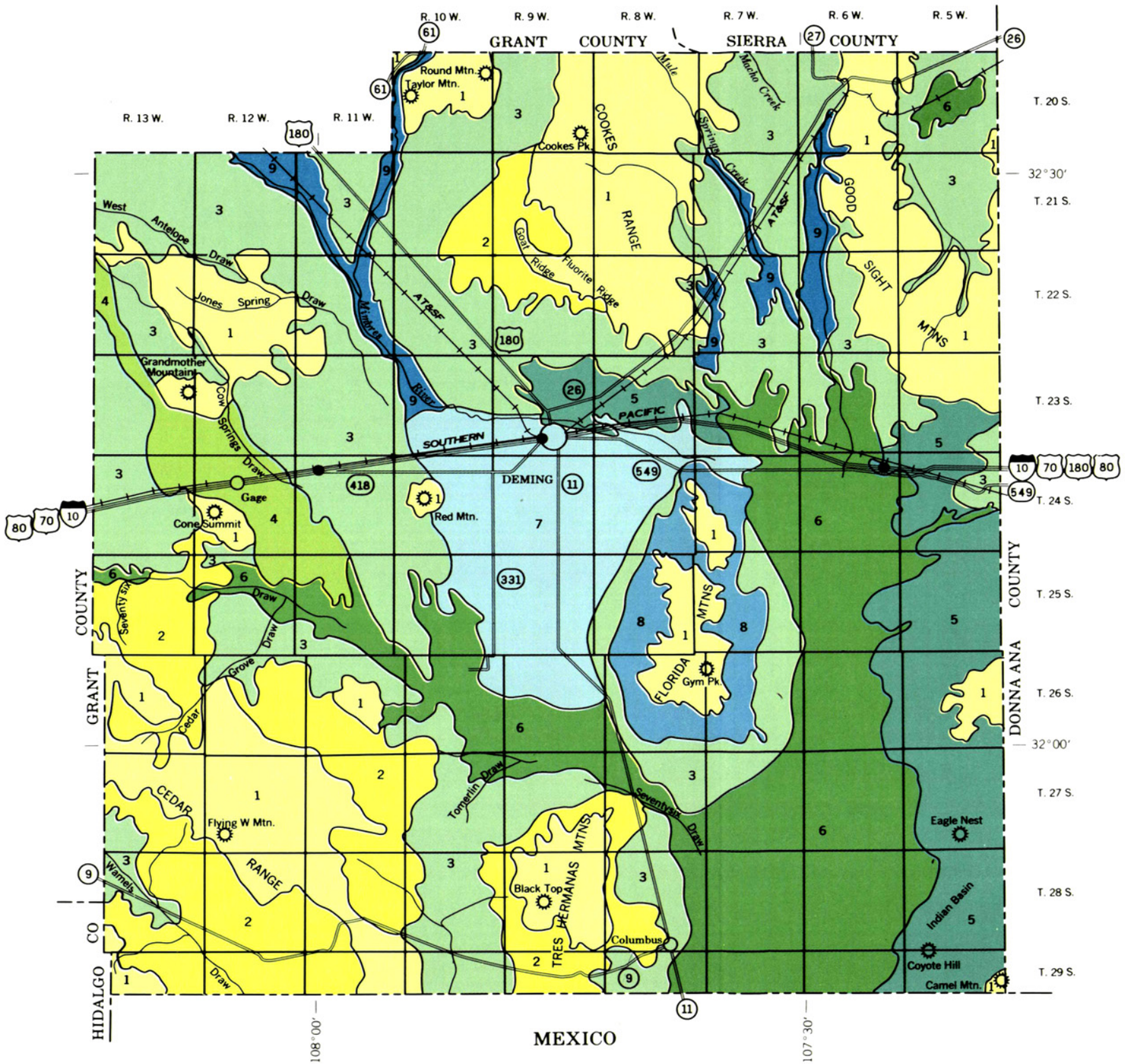


Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SOIL ASSOCIATIONS*

1. Lehmans-Rough broken and rock land association: Shallow and very shallow, medium-textured, rolling to very steep cobbly soils and rock outcrop on hills and mountains
2. Nickel-Upton-Tres Hermanos association: Shallow and deep, moderately coarse and medium textured, nearly level to rolling very gravelly and gravelly limy soils on piedmont slopes
3. Mohave-Stellar association: Deep, moderately fine textured, nearly level to gently undulating soils on alluvial fans
4. Bluepoint-Onite association: Deep, coarse-textured, nearly level to undulating soils on alluvial fans
5. Pintura-Berino-Simona association: Shallow to deep, coarse-textured, nearly level to undulating, hummocky soils on alluvial fans
6. Hondale-Mimbres-Bluepoint association: Deep, moderately fine to coarse textured, nearly level to gently sloping soils on alkali flats
7. Mimbres association: Deep, moderately fine textured, level to nearly level soils on basin floors and alluvial fans
8. Eba association: Deep, moderately fine textured, nearly level to rolling very gravelly soils on piedmont slopes
9. Mimbres-Verhalen association: Deep, moderately fine textured, nearly level soils on alluvial flood plains and bottoms

*The terms for texture in the descriptive heading of each association apply to the surface layer.

Compiled 1979

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

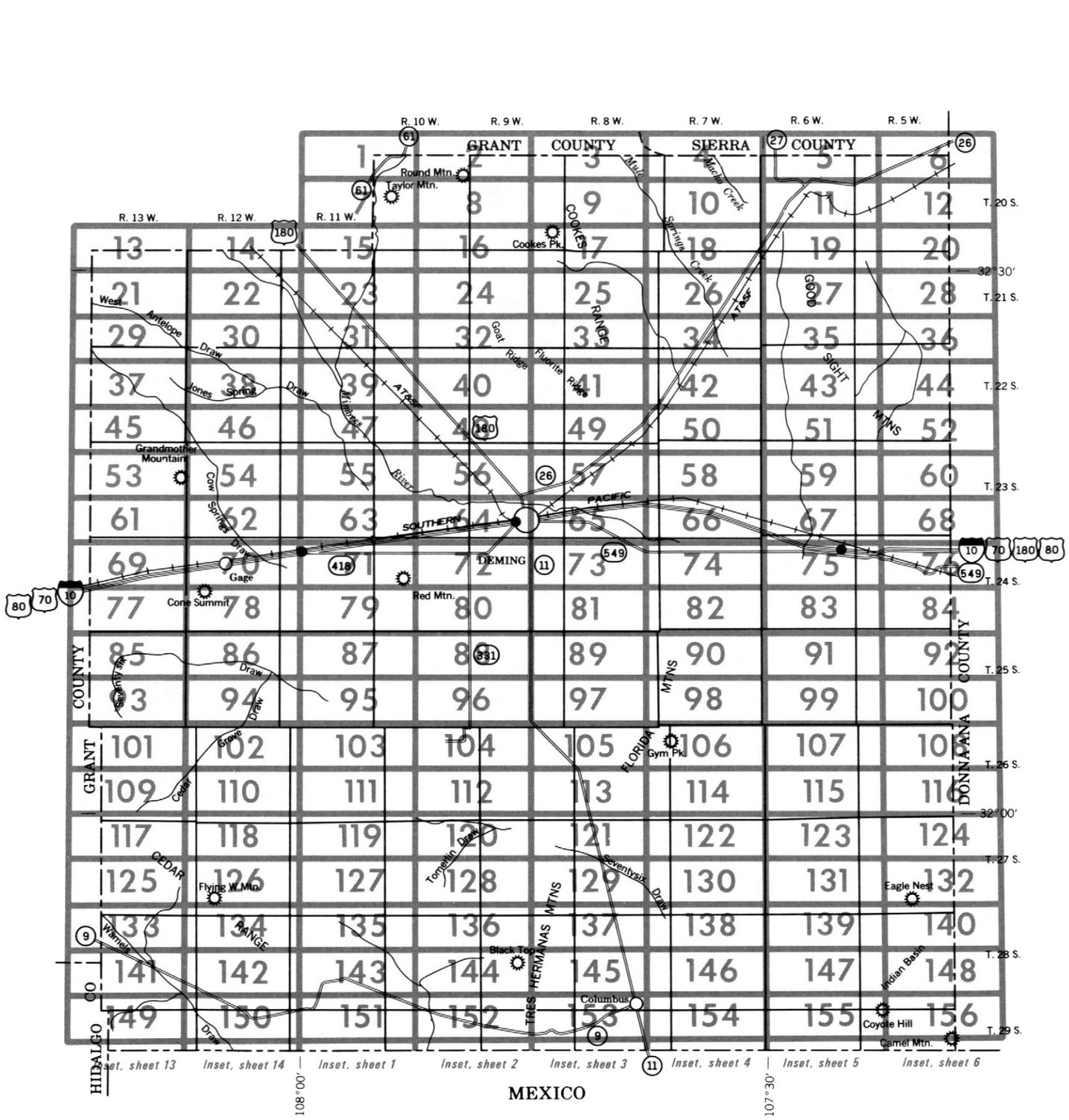
NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

LUNA COUNTY, NEW MEXICO

Scale 1: 506,880

1 0 1 2 3 4 5 6 7 Miles



INDEX TO MAP SHEETS

LUNA COUNTY, NEW MEXICO

Scale 1:506,880

1 0 1 2 3 4 5 6 7 Miles

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit (G.P.)
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (SvE 107)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Borrow pit (B.P.)
- Glacial till

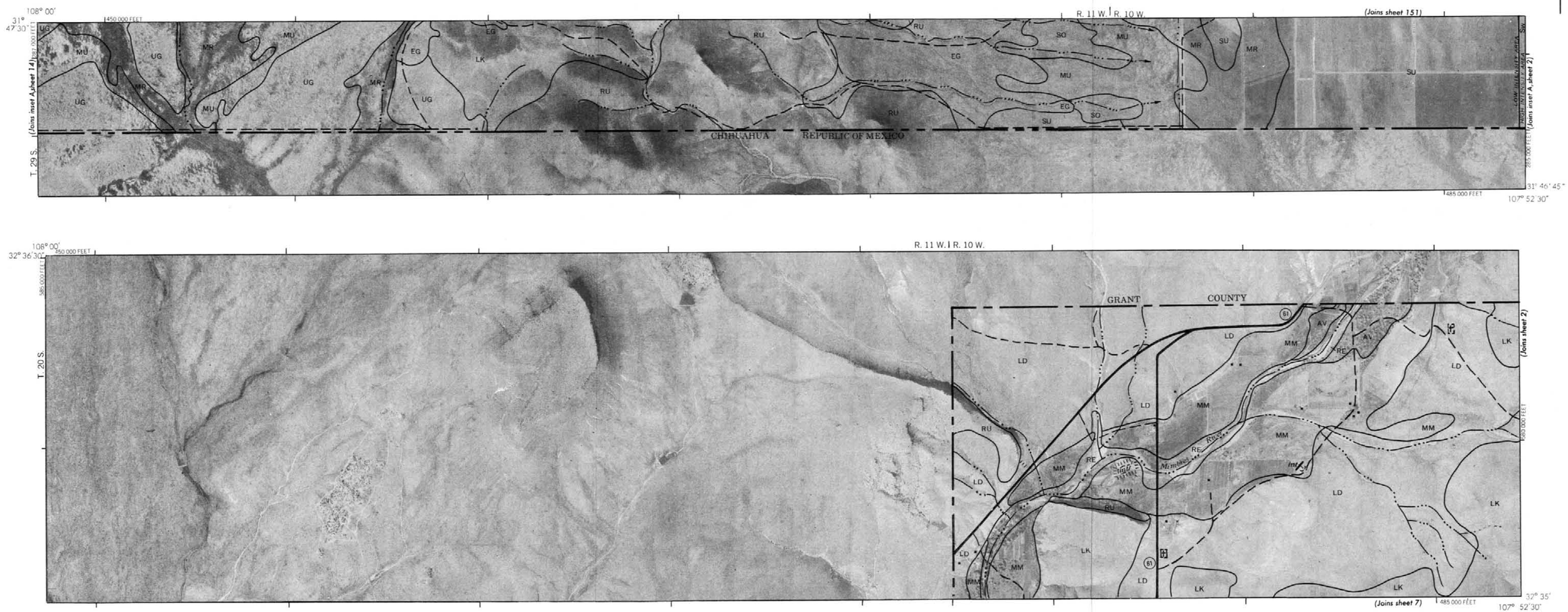
SOIL LEGEND

The first letter, always a capital, is the initial one of the soil name. The second letter is a capital if the map unit is one of the low intensity survey; it is a small letter if the map unit is one of the high intensity survey.

SYMBOL High Intensity	SYMBOL Low Intensity[1]	NAME
—	AG	Akela very gravelly loam, 0 to 10 percent slopes
—	AK	Akela very gravelly loam, 10 to 25 percent slopes
—	AV	Arizo and Vinton soils
—	BA	Berino and Mohave soils
Bd	—	Bluepoint loamy sand, 0 to 3 percent slopes
Be	—	Bluepoint loamy sand, 0 to 3 percent slopes, hummocky
—	BG	Bluepoint loamy sand, 3 to 10 percent slopes
—	BO	Bluepoint-Onite association
—	BR	Brenda gravelly clay loam, 10 to 25 percent slopes
—	CO	Cottonwood and Reeves sandy loams
Da	—	Dona Ana sandy loam
Dc	—	Dona Ana sandy clay loam
Dp	—	Dona Ana-Pintura complex, eroded
—	DT	Dune land-Pintura complex
Eb	EG	Eba very gravelly clay loam, 0 to 10 percent slopes
Ga	—	Gila sandy loam
Gh	—	Gila sandy loam, hummocky
Gm	—	Gila loam
—	GR	Graham rocky clay loam, 10 to 25 percent slopes
Ha	—	Harkey sandy loam
Hh	—	Harkey loam, hummocky
Hk	—	Harkey silt loam
Ho	—	Hondale loam
Hr	—	Hondale soils, strongly alkali
Hs	—	Hondale soils, eroded
—	HT	Hondale-Mimbres complex
—	HU	Hondale-Bluepoint association
Ja	—	Jal fine sandy loam
Ka	—	Karro silty clay loam
—	LC	Ledru gravelly clay loam, 10 to 25 percent slopes
—	LD	Lehmans very rocky loam, 0 to 10 percent slopes
—	LK	Lehmans extremely rocky loam, 10 to 25 percent slopes
—	LM	Lozier extremely rocky loam, 0 to 10 percent slopes
—	LU	Luxor extremely stony sandy loam
Ma	—	Maricopa sandy loam
Mah	—	Maricopa sandy loam, hummocky
Mb	—	Mimbres loam
Mc	—	Mimbres silty clay loam
Md	—	Mimbres silty clay loam, alkali
Me	—	Mimbres silty clay loam, sandy subsoil variant
—	MM	Mimbres soils
Mn	—	Mimbres soils, eroded
—	MR	Mimbres and Verhalen soils
Ms	—	Mohave sandy loam, 0 to 1 percent slopes
Mt	—	Mohave sandy clay loam, 0 to 1 percent slopes
—	MU	Mohave sandy clay loam, 0 to 3 percent slopes
Mv	—	Mohave-Pintura complex, eroded
—	NK	Nickel very gravelly sandy loam, 3 to 9 percent slopes
—	NT	Nickel-Tres Hermanos complex
—	PB	Pintura-Berino complex, eroded
—	PS	Pintura-Simona complex, eroded
—	RE	Riverwash
—	RO	Rock land
—	RU	Rough broken and rock land
—	SD	Simona loamy sand, 0 to 5 percent slopes
Sn	SO	Sonoita gravelly sandy loam
Ss	—	Sonoita-Pintura complex, eroded
—	ST	Stellar sandy loam
—	SU	Stellar silty clay loam
Sw	—	Stellar silty clay loam, 0 to 1 percent slopes
—	SX	Stony land
—	TH	Tres Hermanos gravelly loam, 1 to 5 percent slopes
—	TU	Turney-Dona Ana association
—	UG	Upton gravelly sandy loam, 3 to 10 percent slopes
—	UP	Upton gravelly loam, 0 to 10 percent slopes
Ve	—	Verhalen silty clay loam
Vh	—	Verhalen silty clay loam, alkali
Yt	—	Yturbide loamy sand

[1] The composition of these units is more variable than that of the others in the County but has been controlled well enough to interpret for the expected use of the soils.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 1

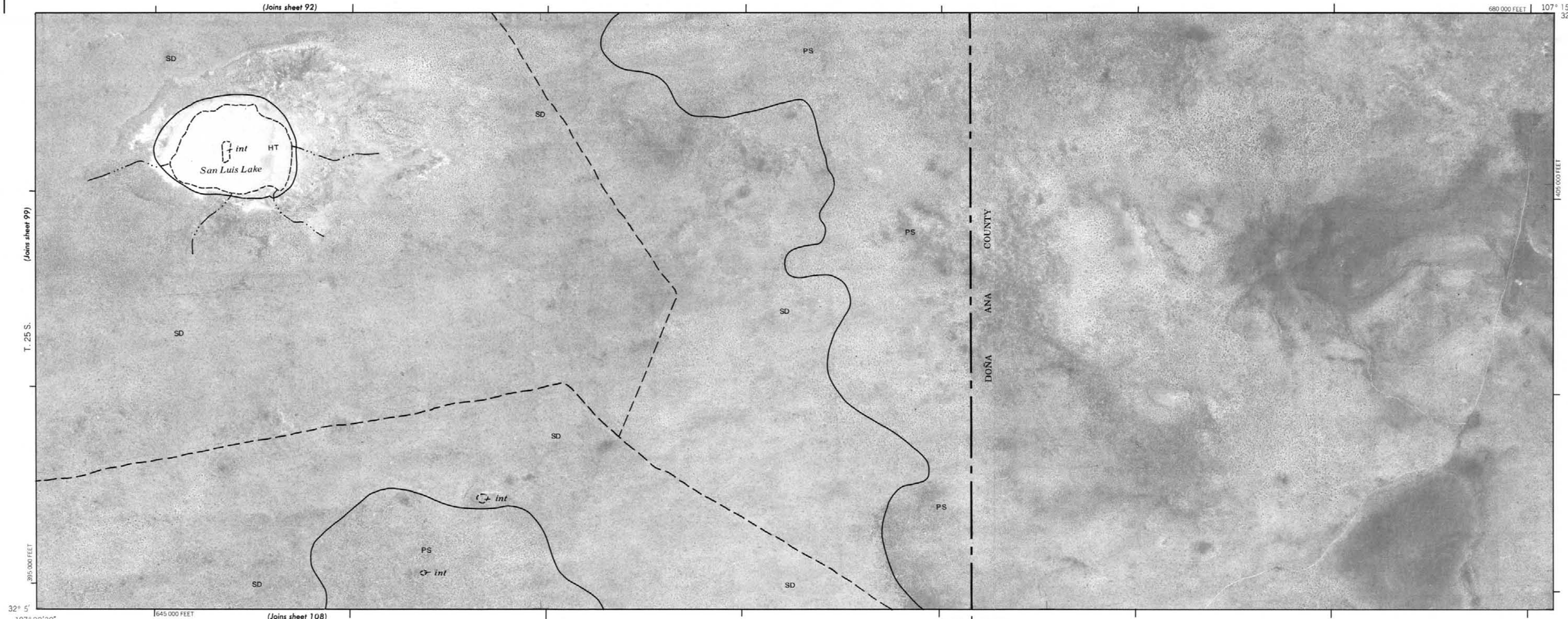


This map was compiled on 1974 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N

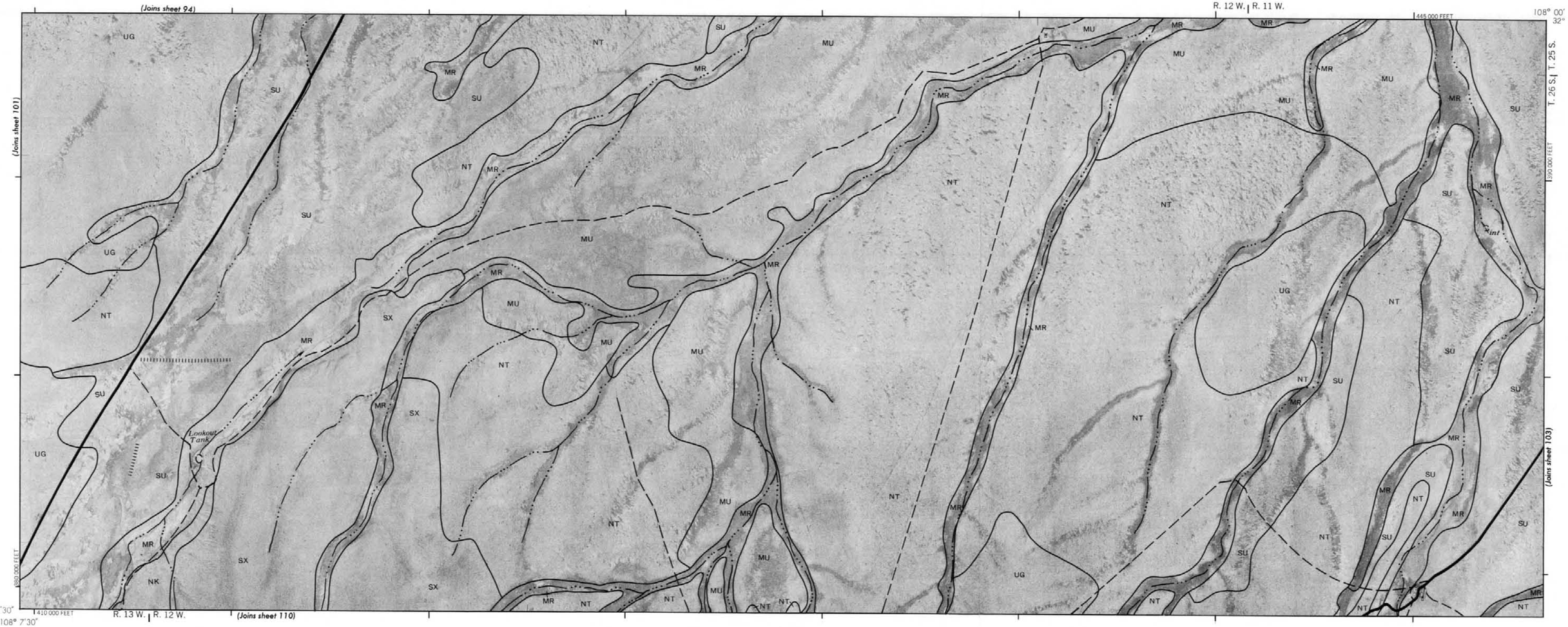
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. 5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5 000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. 5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 104

Scale 1:24000

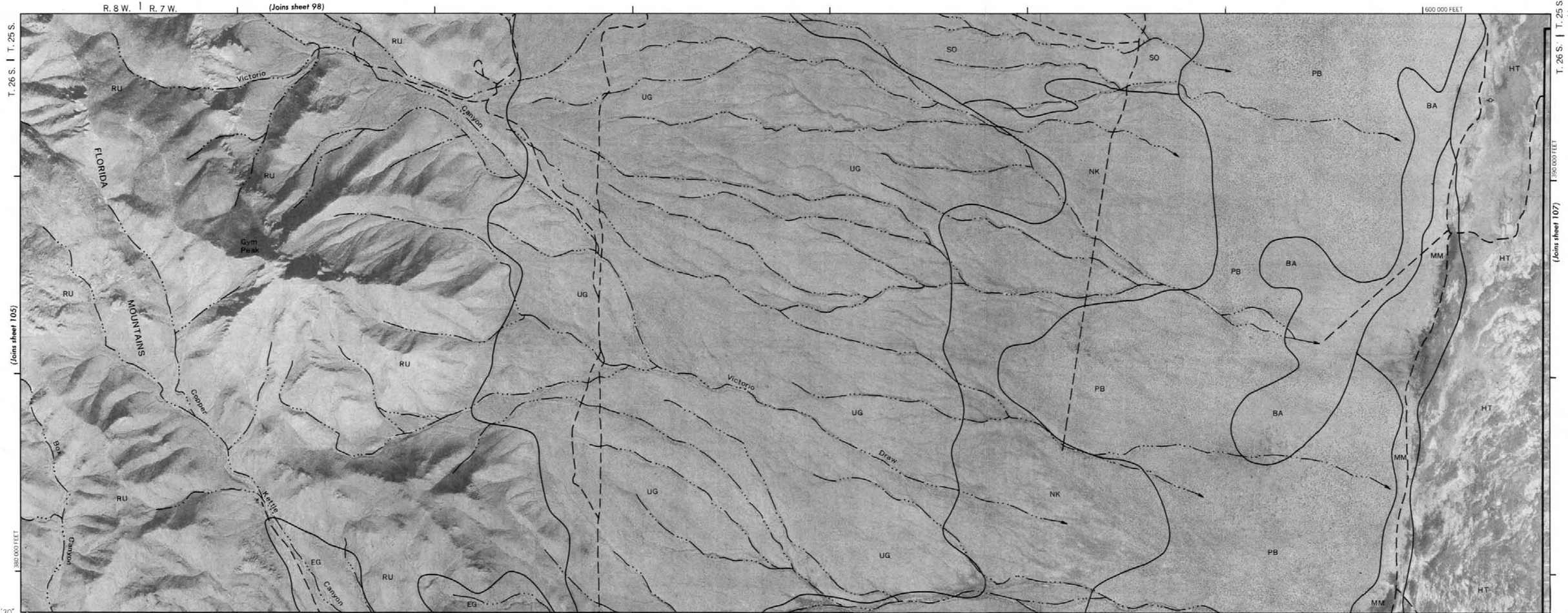
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotographs by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

107° 30'
32° 5'
605 000 FEET
390 000 FEET
R. 6 W. | R. 5 W.
(Joins sheet 99)
T. 26 S. | T. 25 S.
(Joins sheet 106)
(Joins sheet 108)
(Joins sheet 115)
640 000 FEET
380 000 FEET
32° 02'30"
107° 22'30"

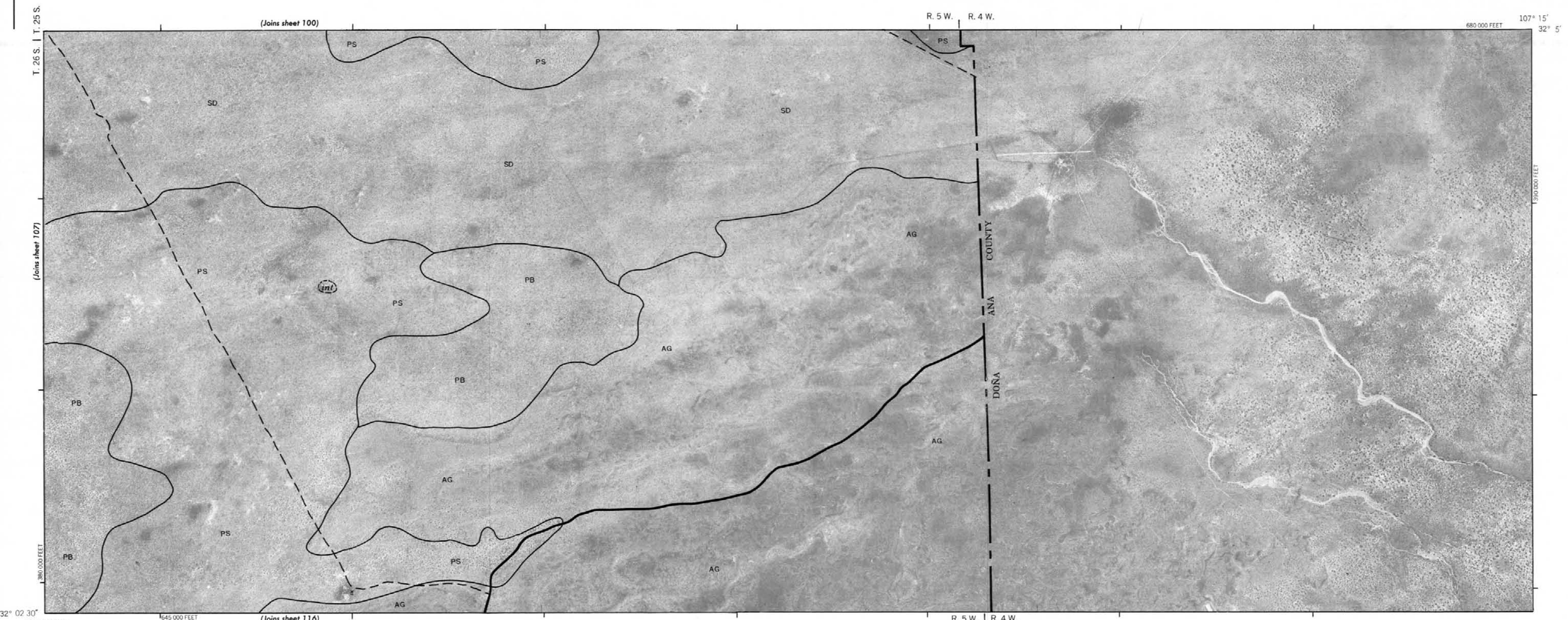
HU HT BO UG SD PS RU PB DT

intermittent

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 108



Scale 1:24000

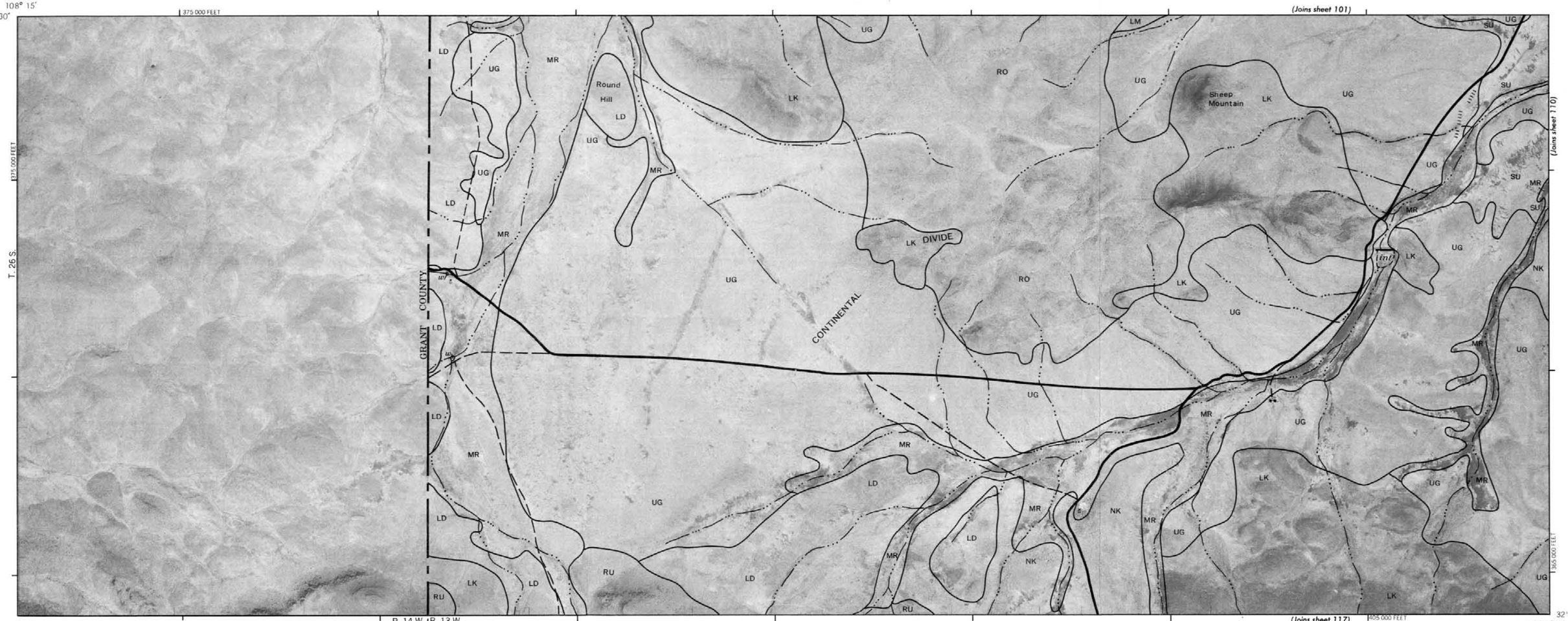
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey Photogeography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N

Scale 1:24000

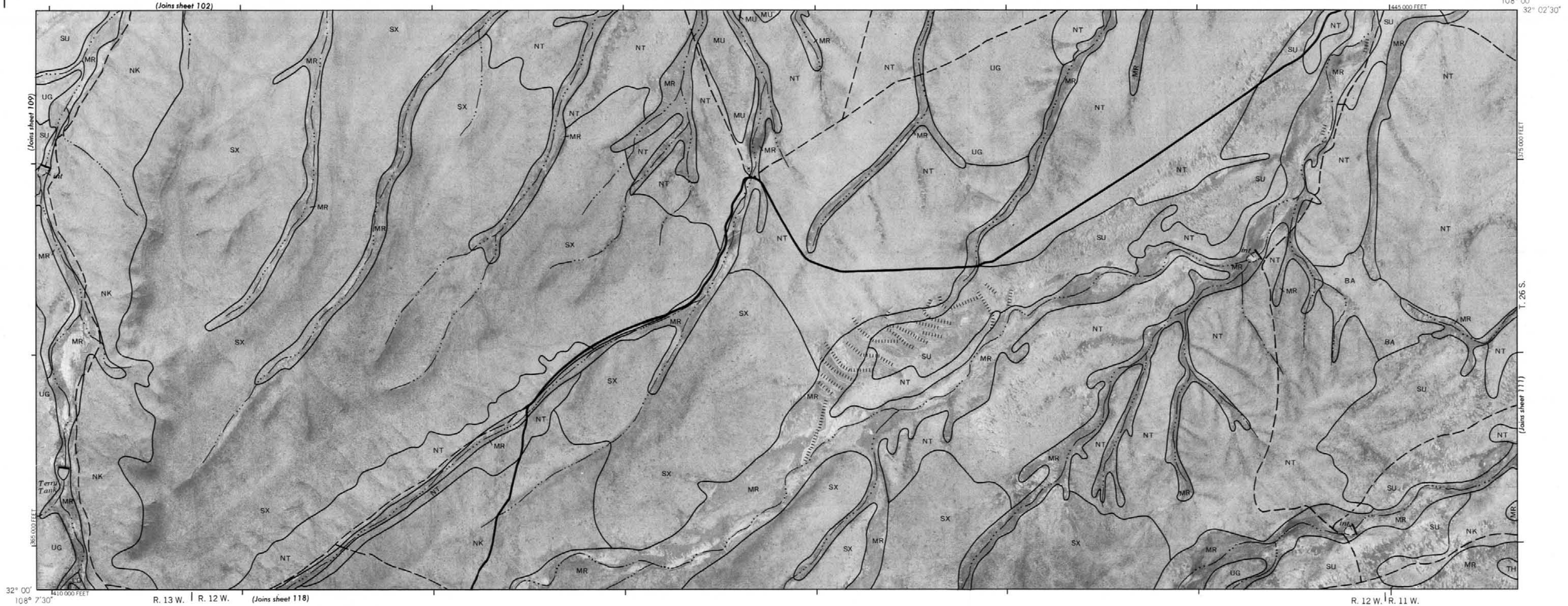
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974 1975 and 1976. U.S. Department of The Interior, Geological Survey or thophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 110

N



1 0 1 2 Miles

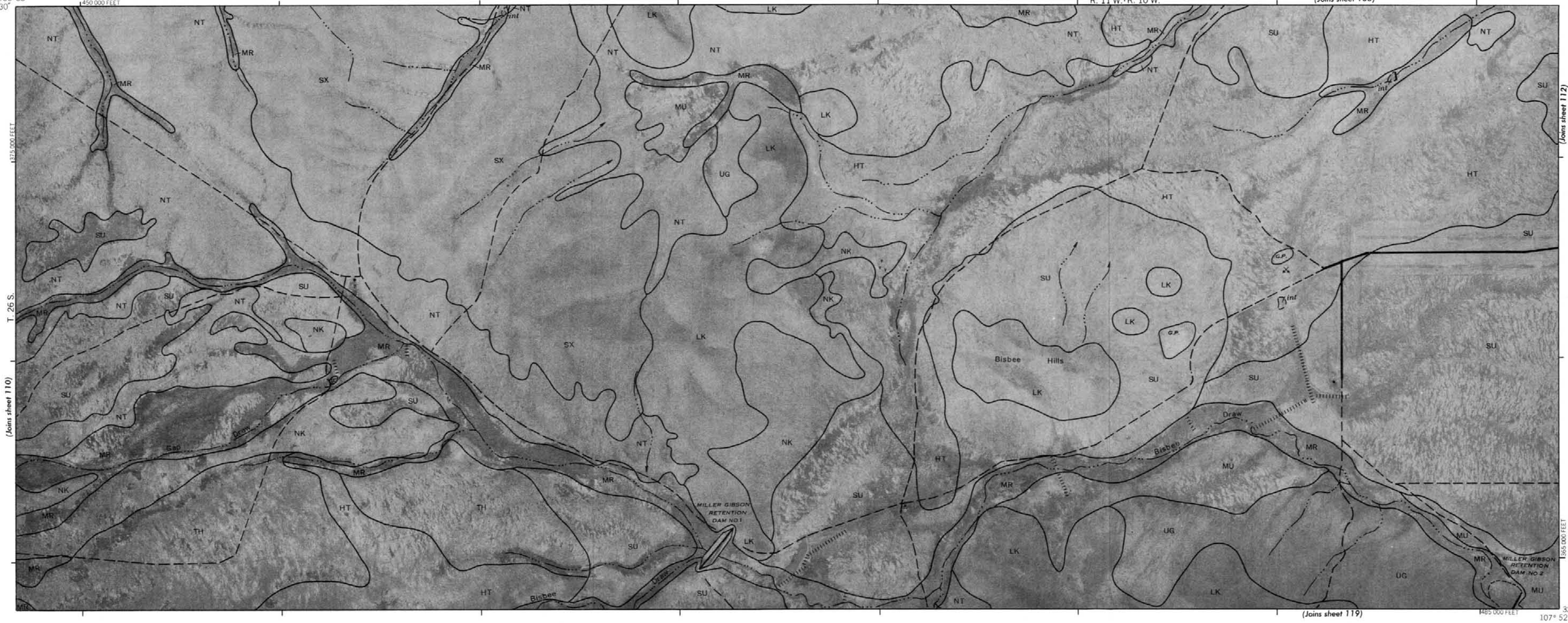
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1924, 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

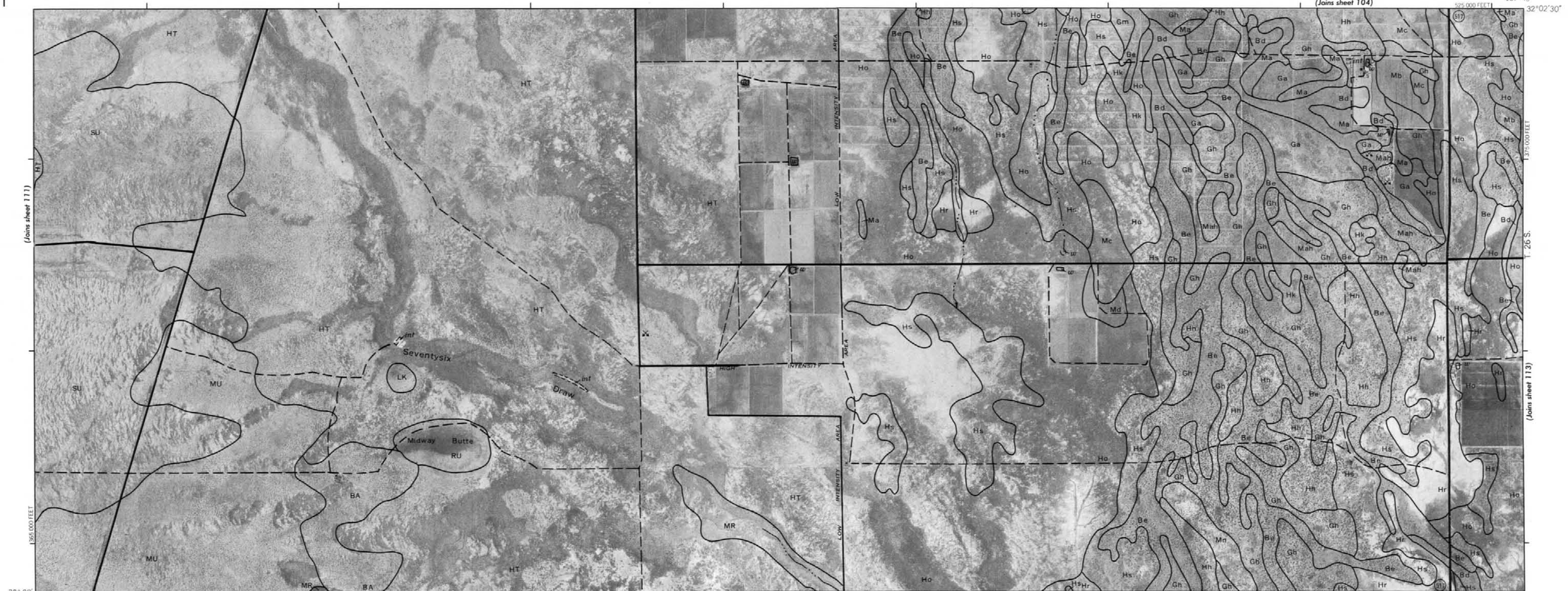


1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 112



Scale 1:24000

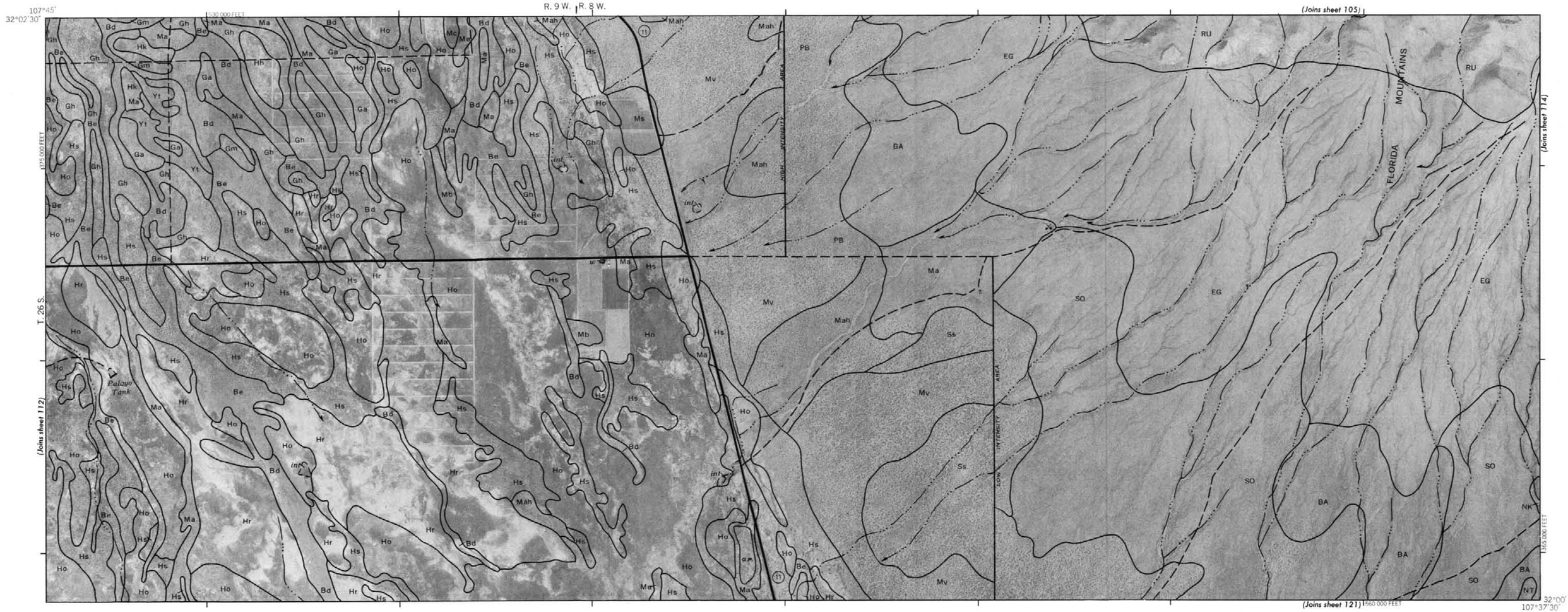
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000-foot grid ticks based on state coordinate system: Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975, and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



Scale 1:24000

This map was compiled on 1974 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.
This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

1 3/4 1/2 1/4 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N

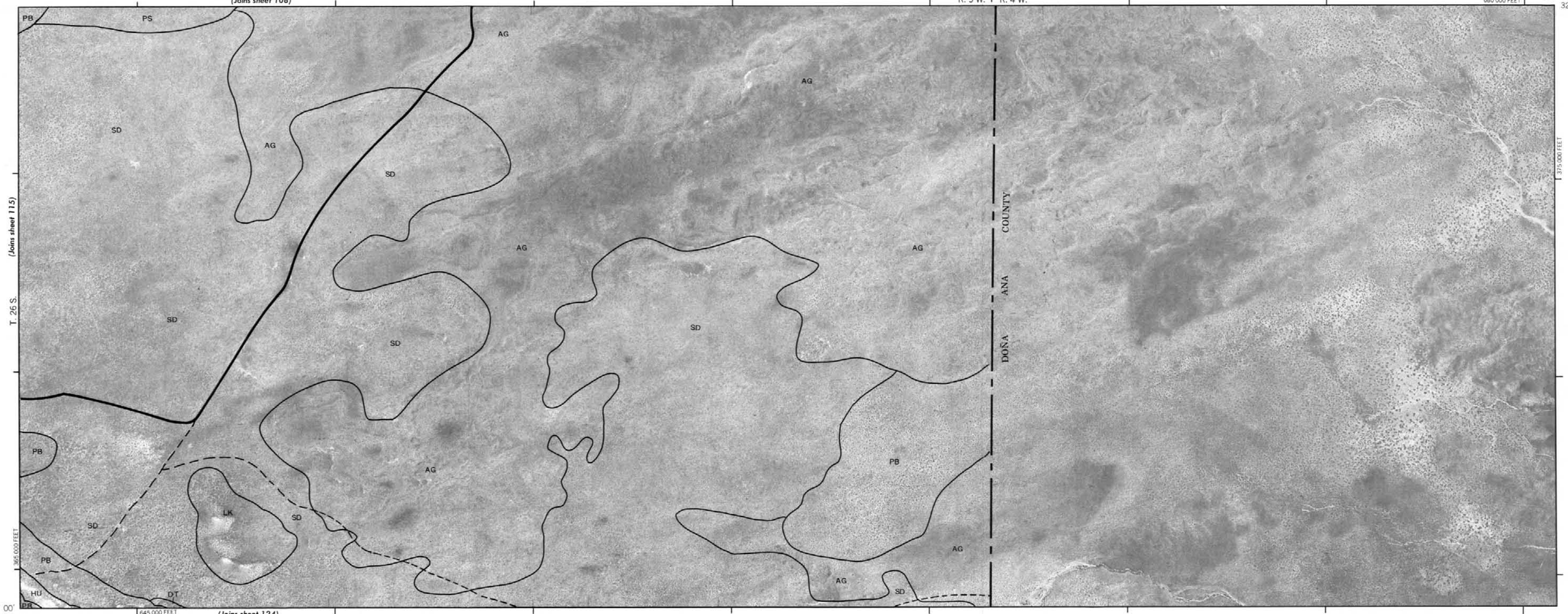
This map was compiled on 1974, 1975 and 1976. U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

107° 30'
32° 02'30"
605 000 FEET
375 000 FEET
T. 26 S.
(Joins sheet 114)
(Joins sheet 107)
(Joins sheet 116)
(Joins sheet 123)
365 000 FEET
640 000 FEET
32° 00'
107° 22'30"
R. 6 W. | R. 5 W.

BO HT HU MM DT PB SD BA int

1 ¾ ½ ¼ 0 1 2 Miles
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet
Scale 1:24000

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

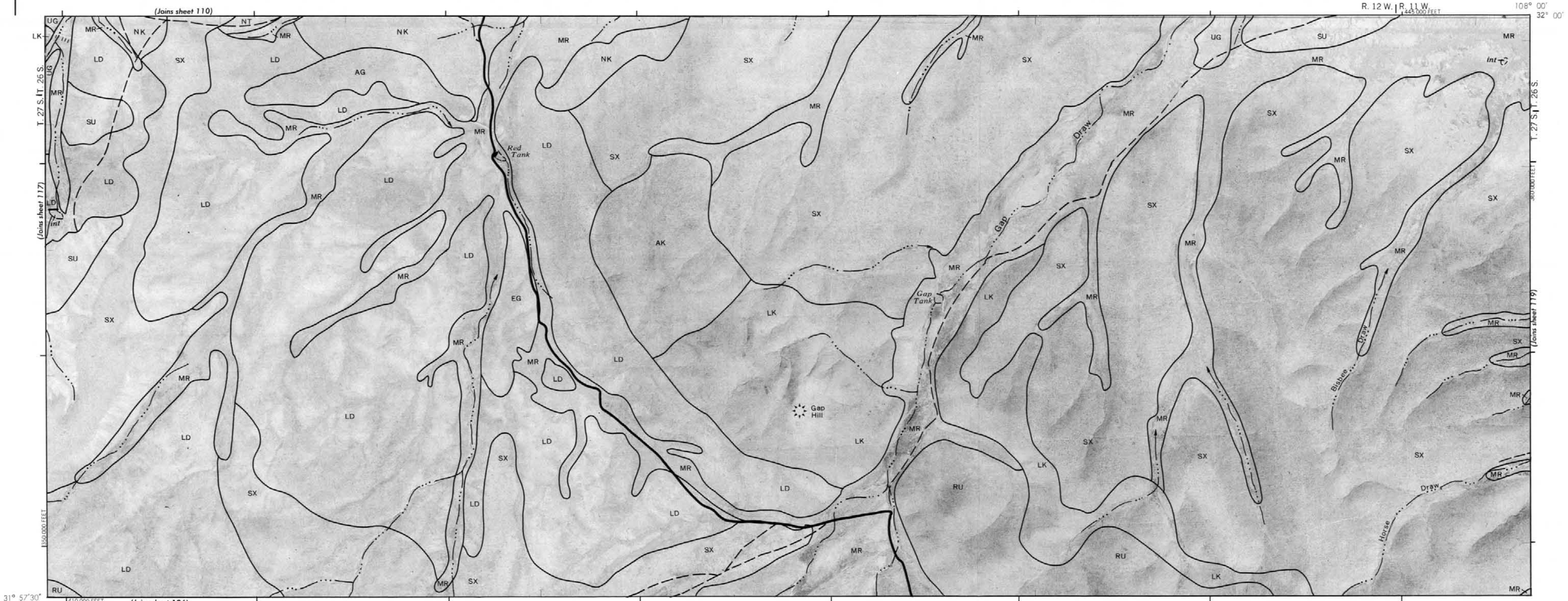
This map was compiled on 1974, 1975, and 1976. U.S. Department of the Interior, Geological Survey; orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

1 ¾ ½ ¼ 0 1 2 Miles

5,000 4,000 3,000 2,000 1,000 0 5,000 10,000 Feet

Scale 1:24,000



Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N

108°00'
32°00'

450 000 FEET

R. 11 W. | R. 10 W.

(Joins sheet 111)

T. 27 S. | T. 26 S.

(Joins sheet 118)

(Joins sheet 120)

(Joins sheet 127)

350 000 FEET

485 000 FEET

31° 57'30"

107° 52'30"

MILLER GIBSON DAM No. 2

MILLER GIBSON DAM NO 1

MILLER GIBSON DAM NO 3

Bisbee Draw

Horse Draw

Suckerville Draw

Tomerlin Draw

Kent Tank

Art Tank

Terry Tank

int

TH HT MR SU NK NT LK UG SX MU

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 12

N

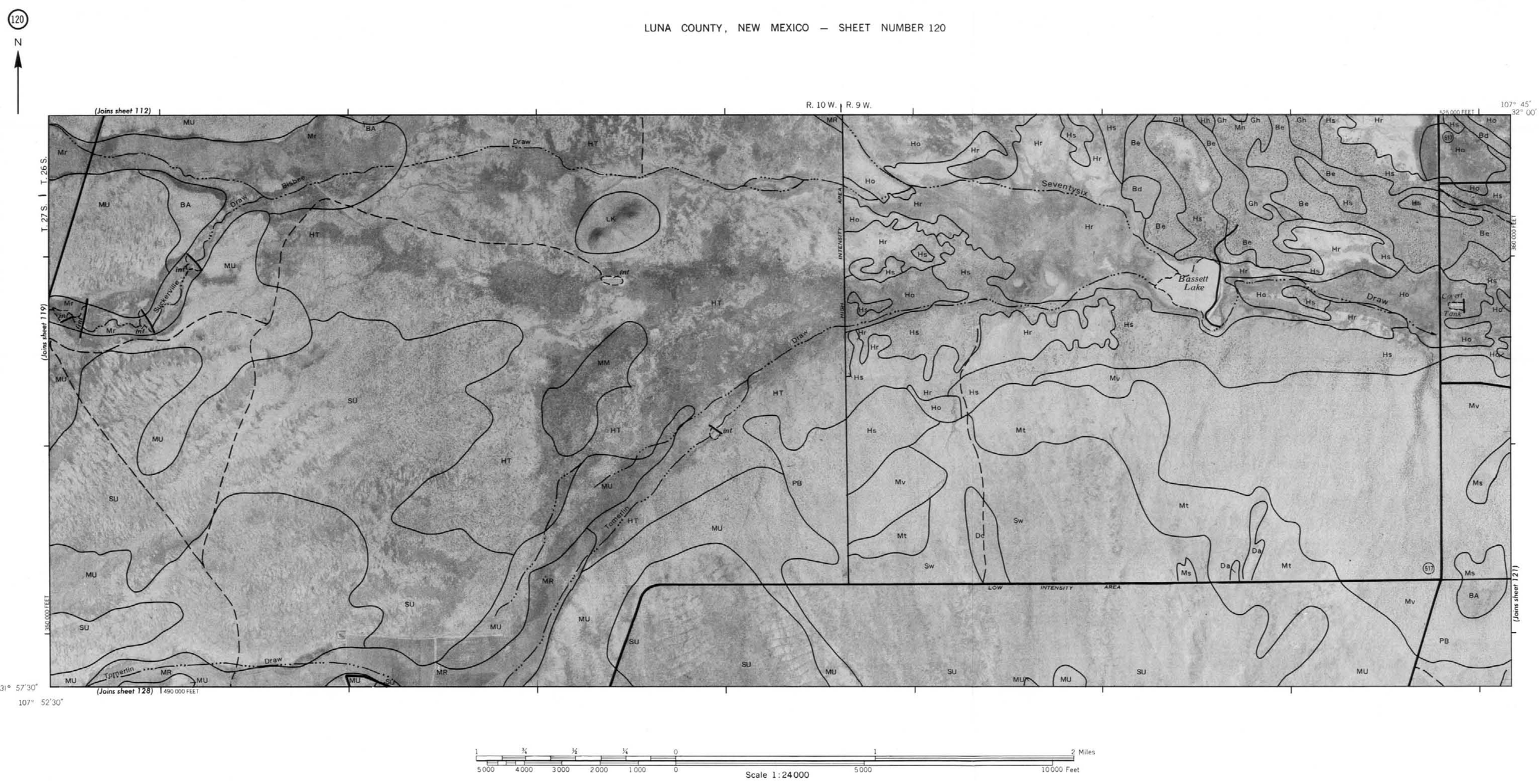
Scale 1:24000

1 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.



5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 122

N

Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

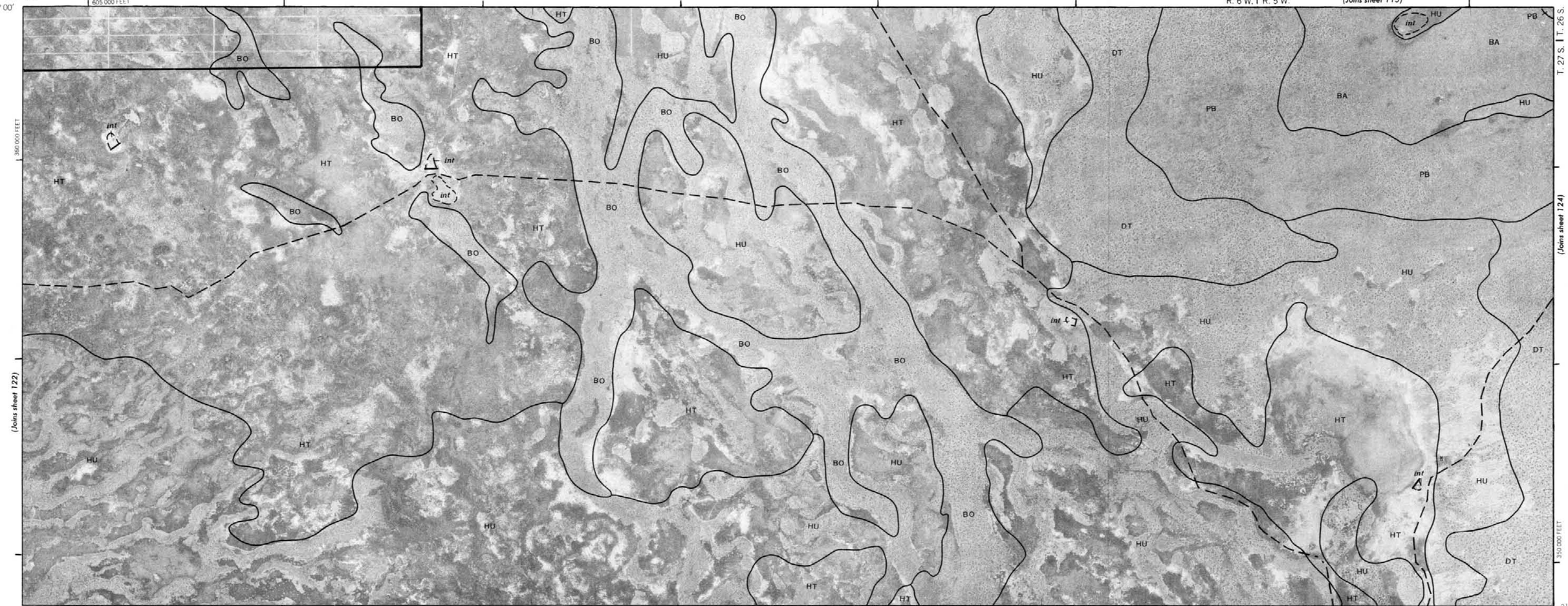
5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

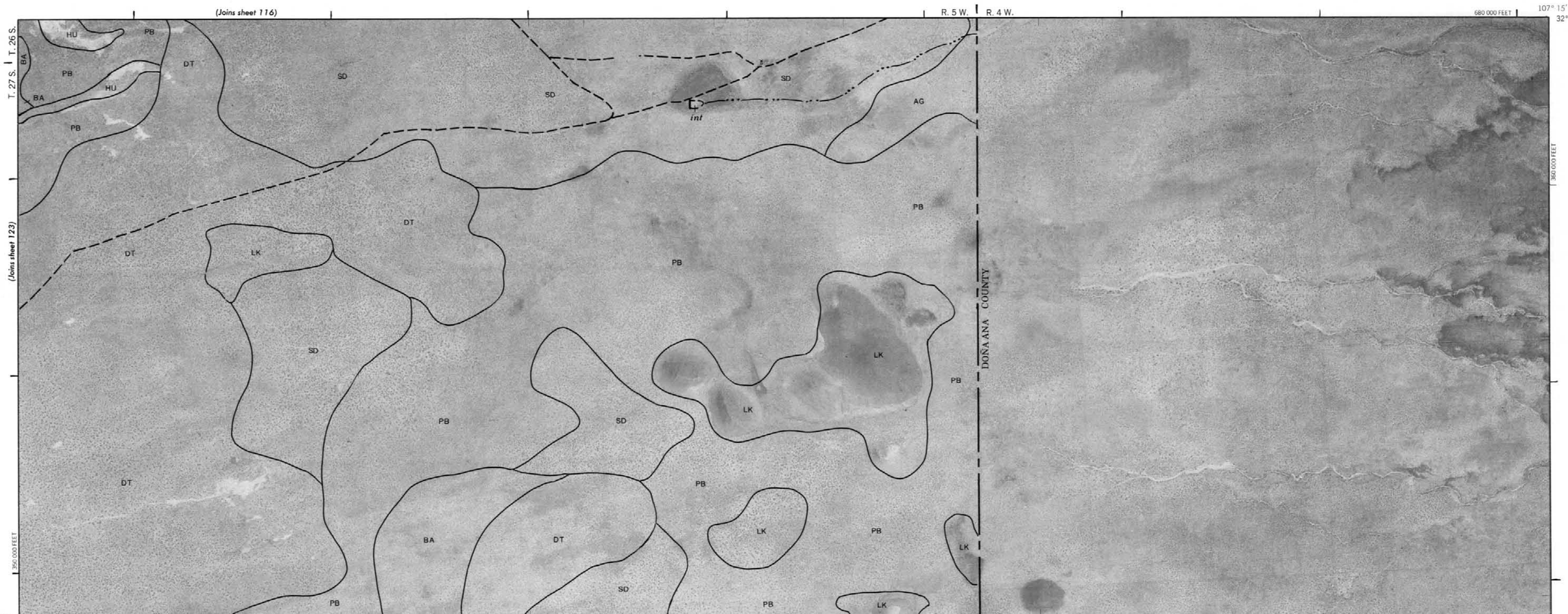
N

107° 30'
32° 00'
605 000 FEET
R. 6 W. | R. 5 W.
(Joins sheet 115)
T. 27 S. | T. 26 S.
(Joins sheet 124)
(Joins sheet 122)
350 000 FEET
(Joins sheet 131)
640 000 FEET
31° 57'30"
107° 22'30"



1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This map was compiled on 1974, 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

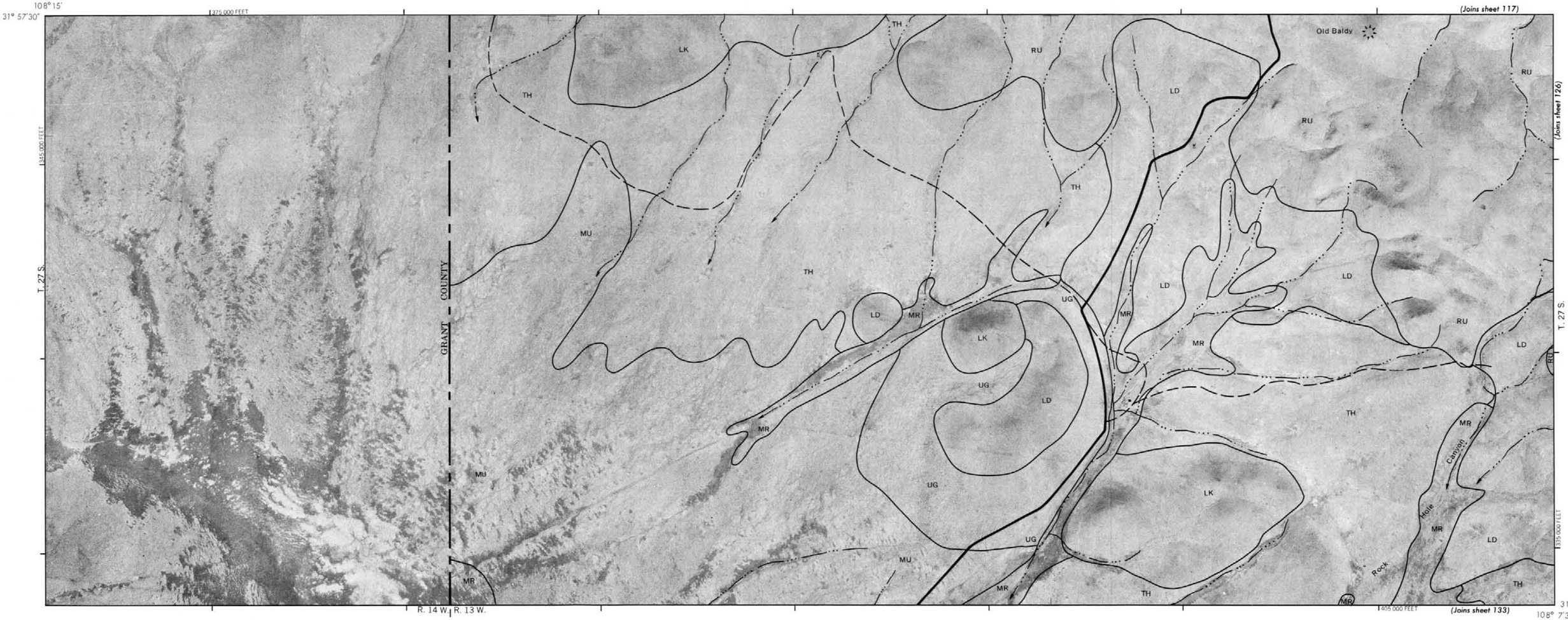
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N

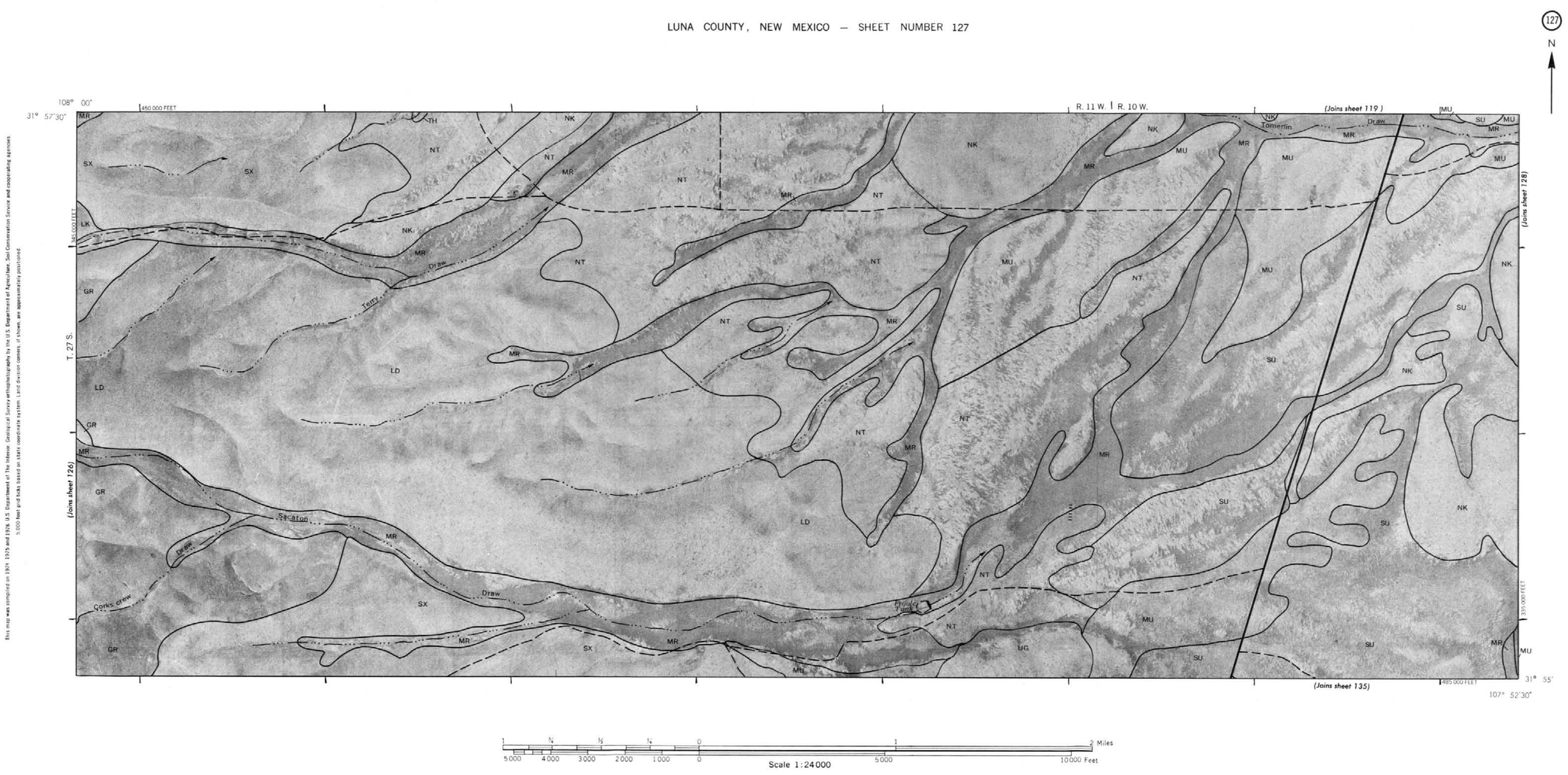
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

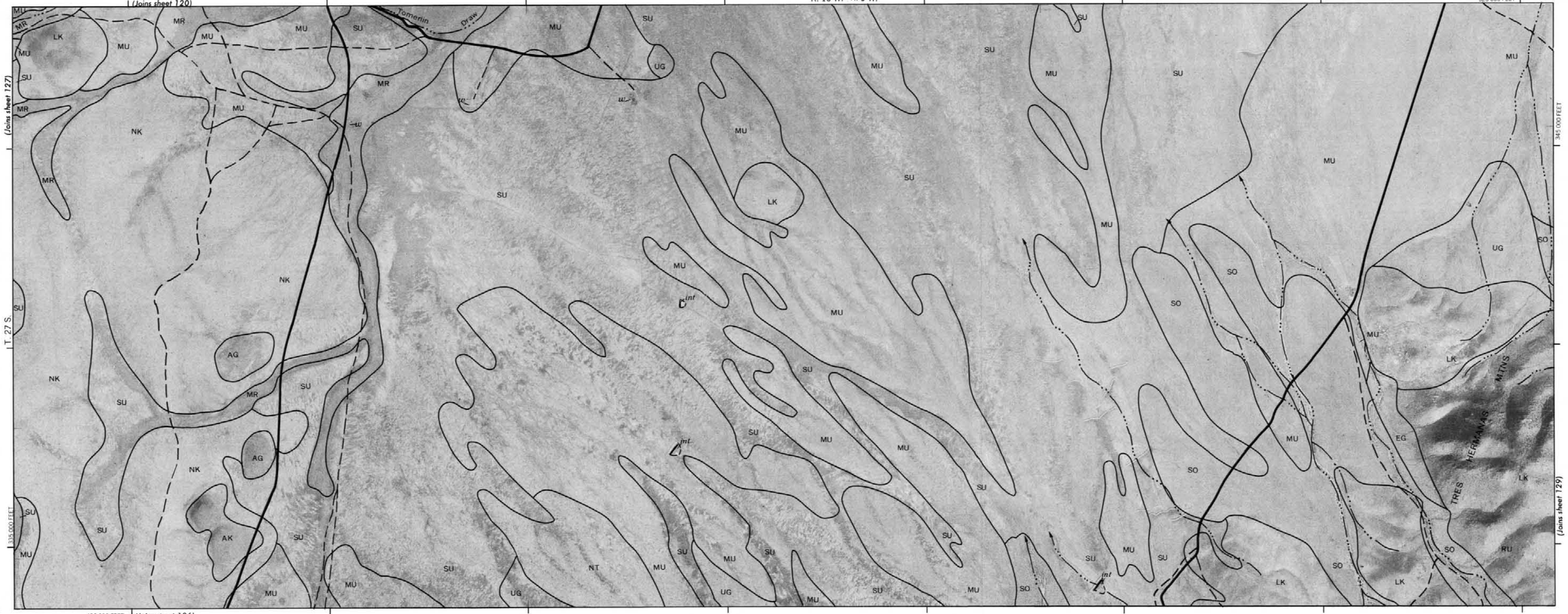
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.



This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. 5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N



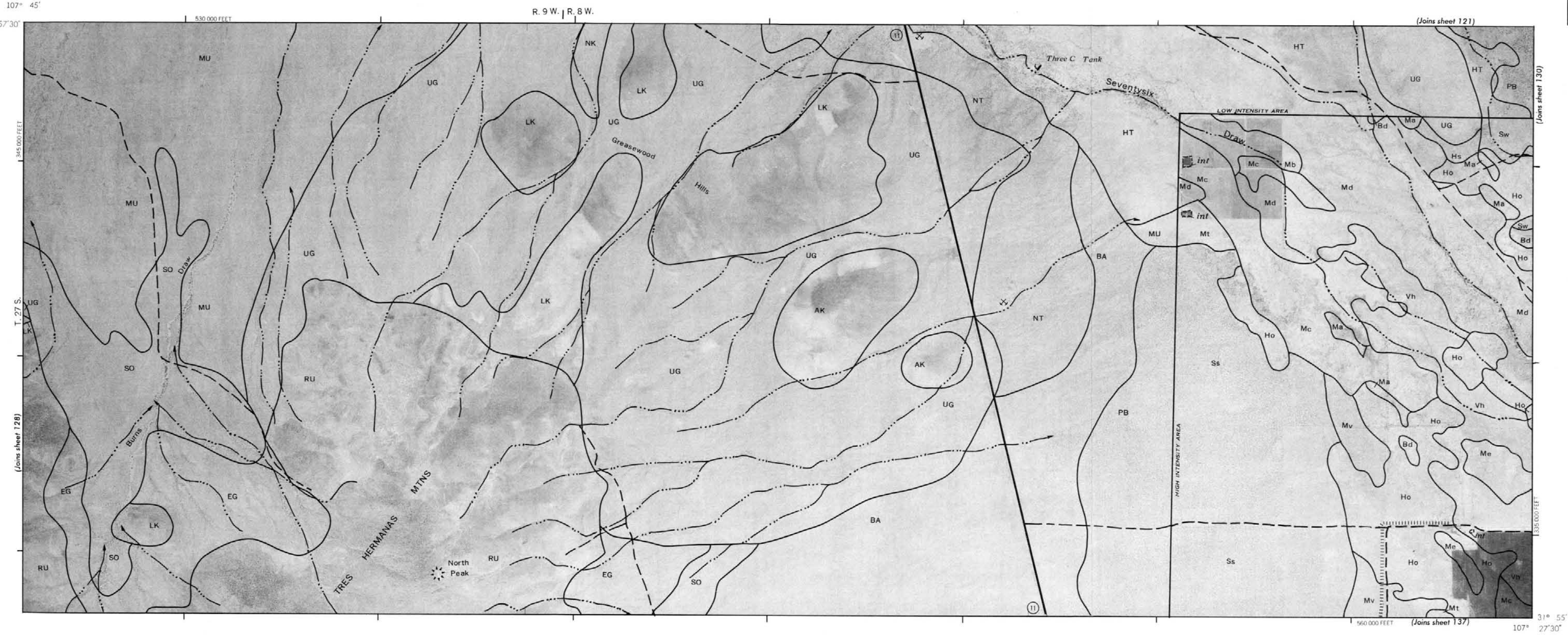
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

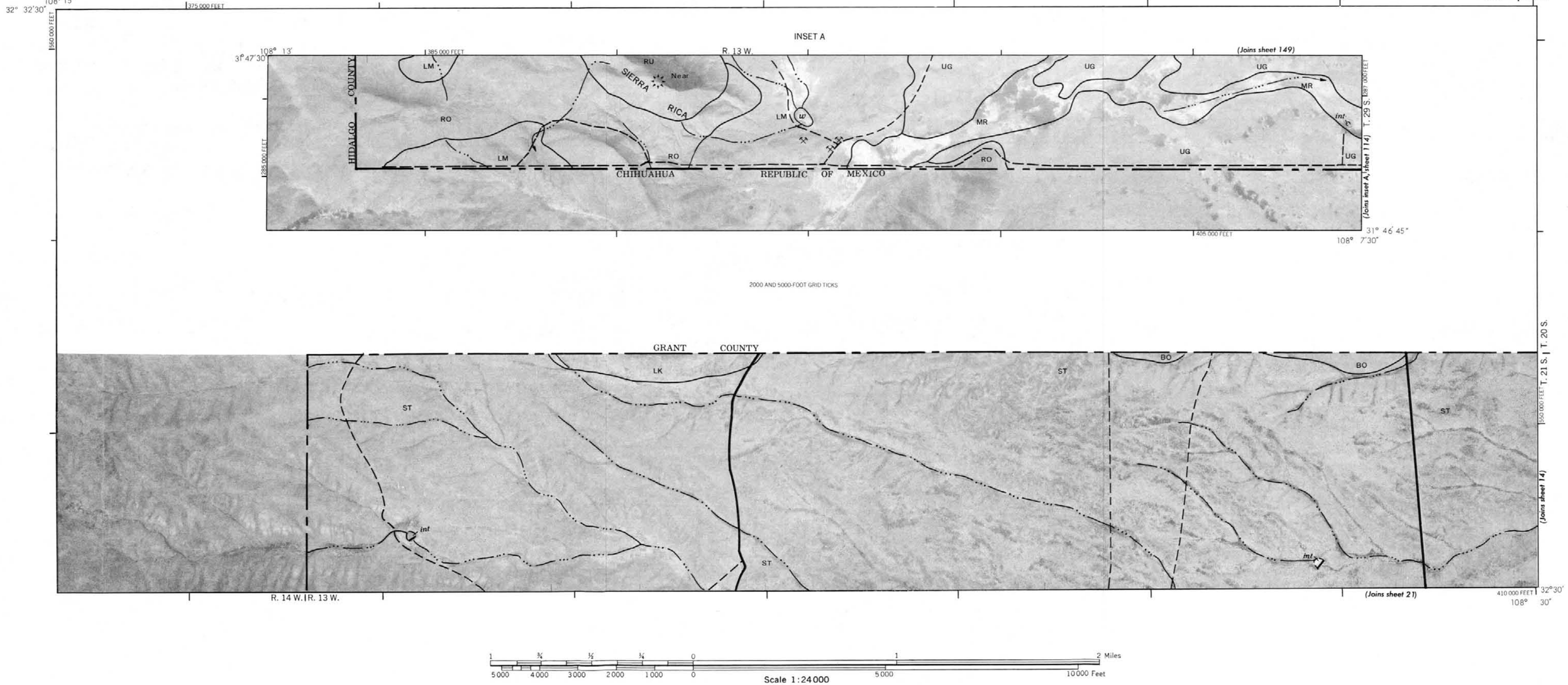


This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N



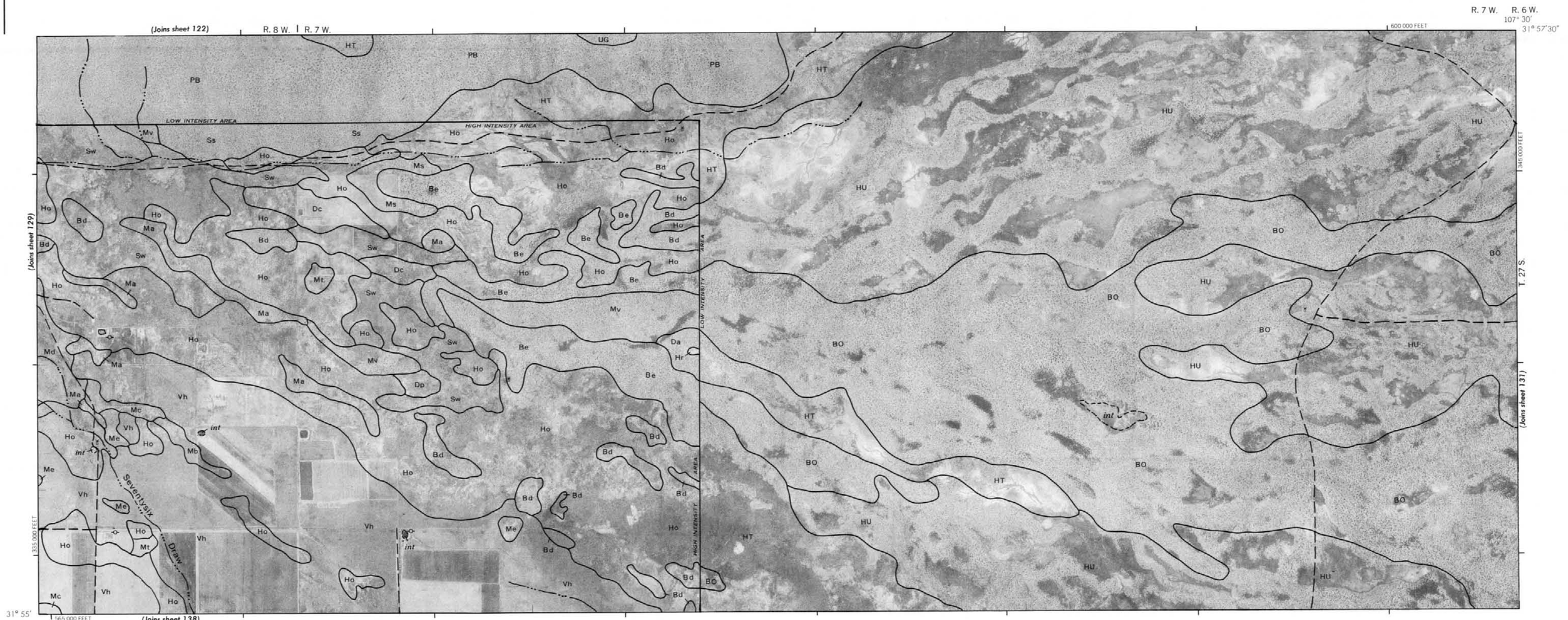
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 130



Scale 1:24000

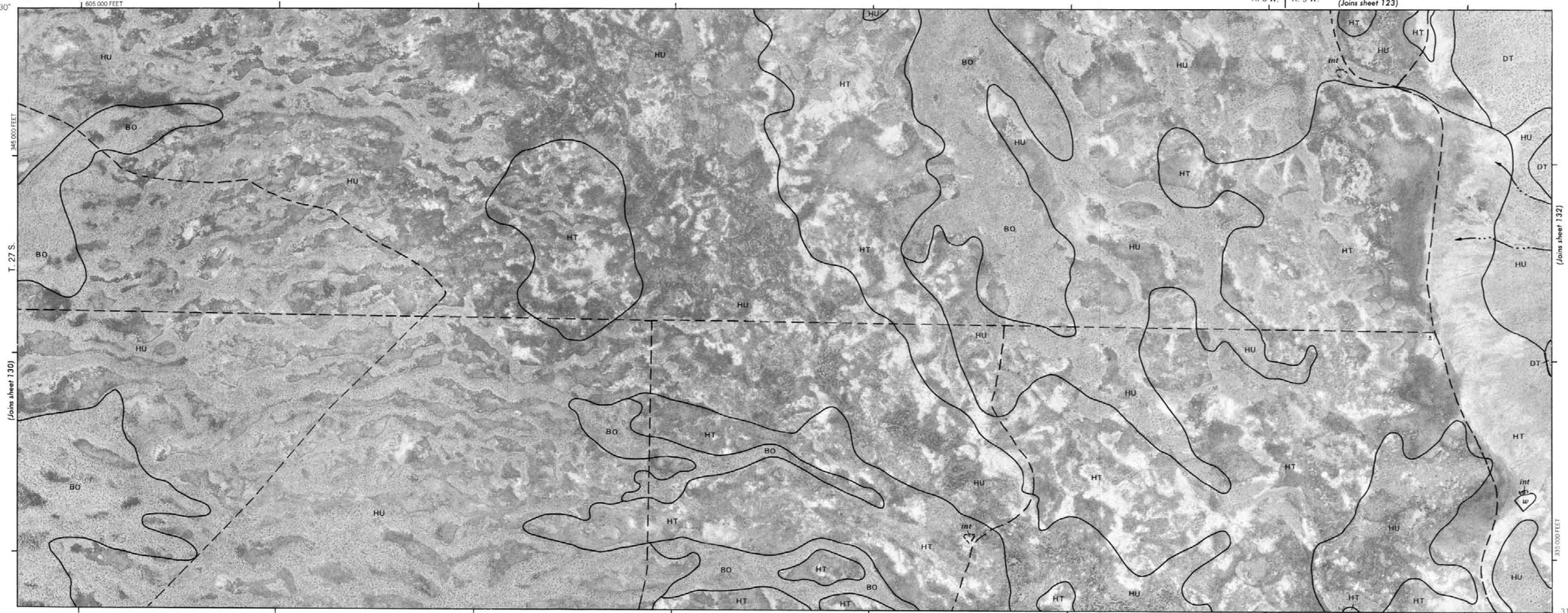
1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

This map was compiled on 1974, 1973 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



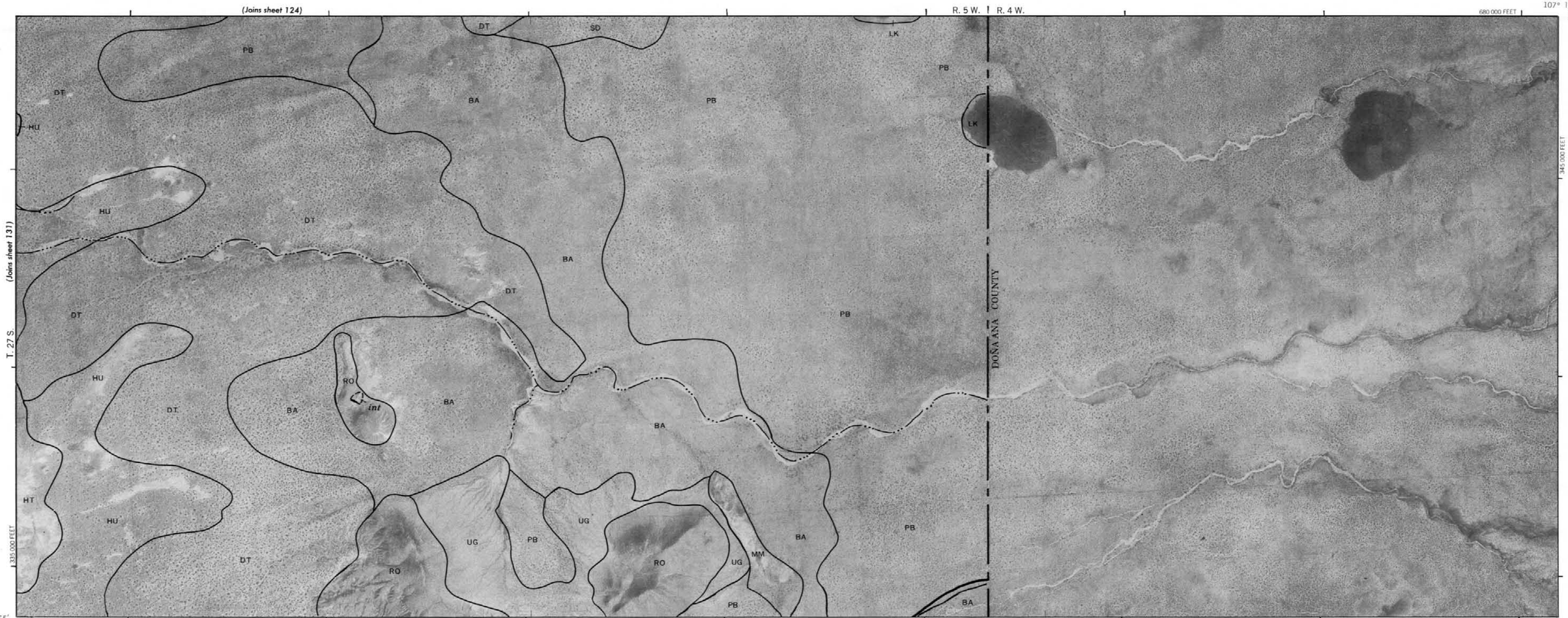
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 132

N



1 ¾ ½ ¼ 0 1 2 Miles

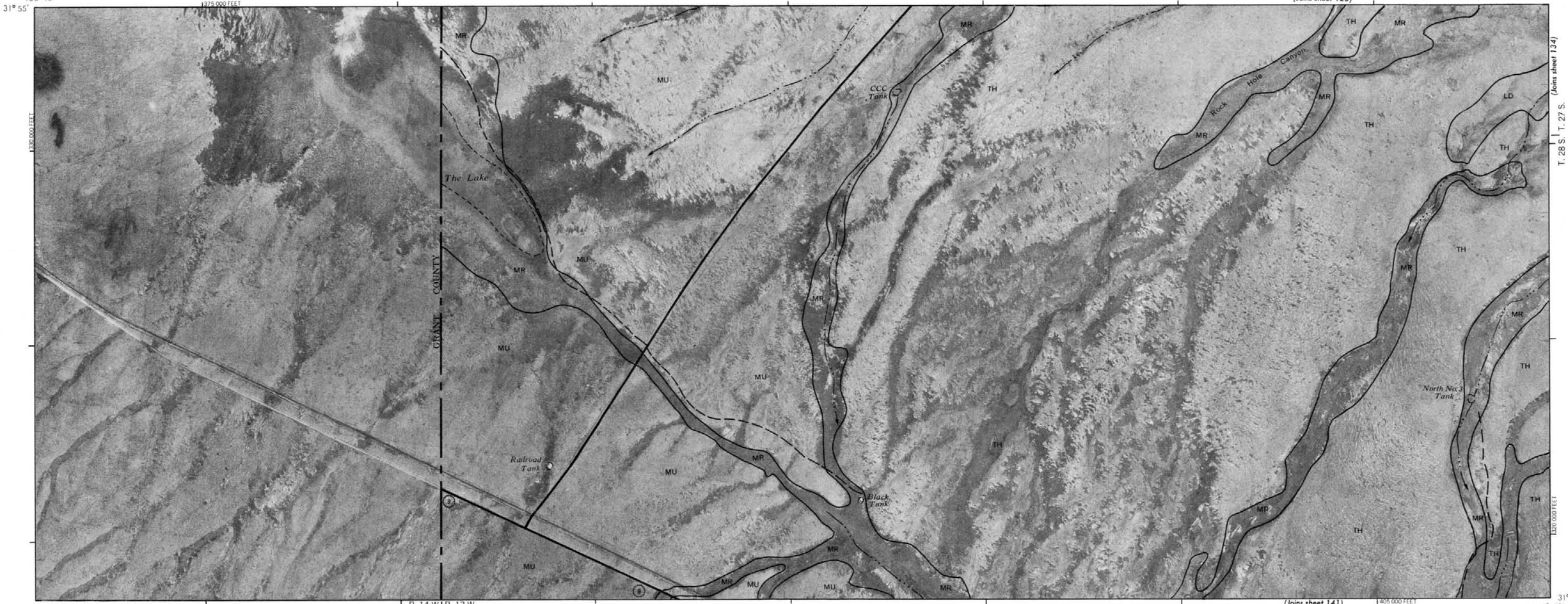
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

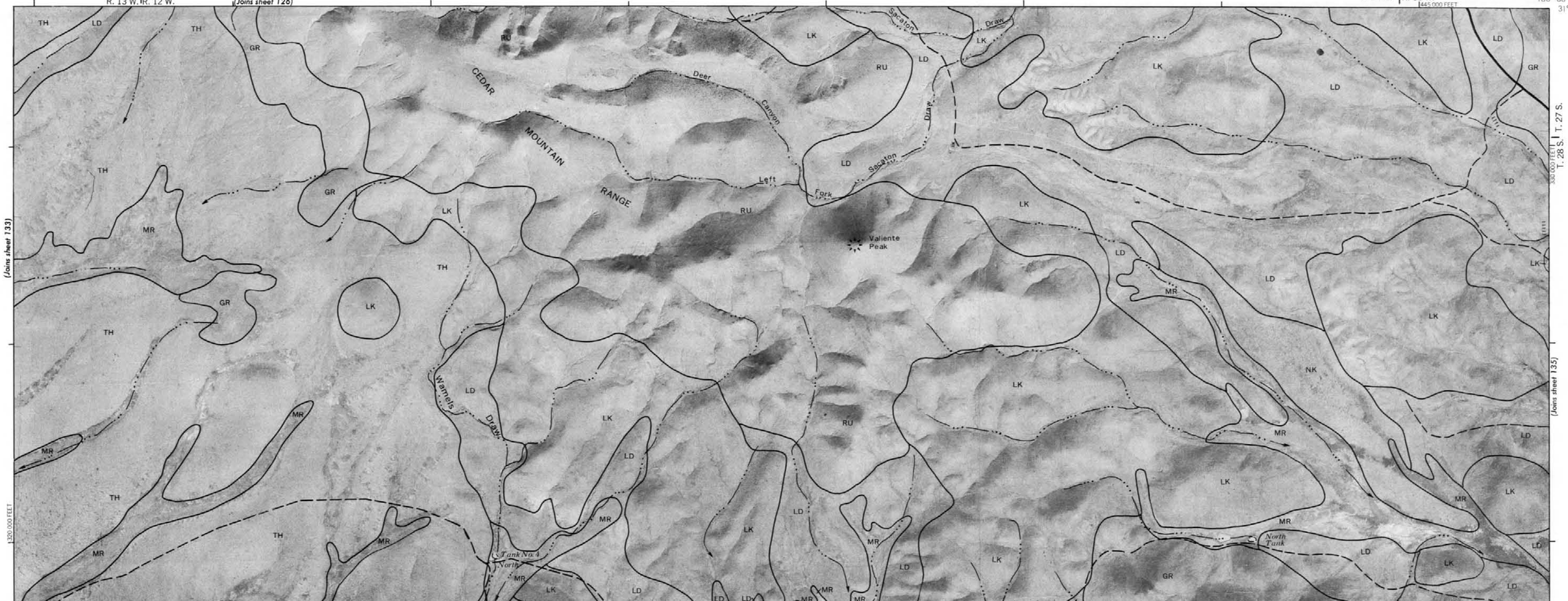


1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N



Scale 1:24000

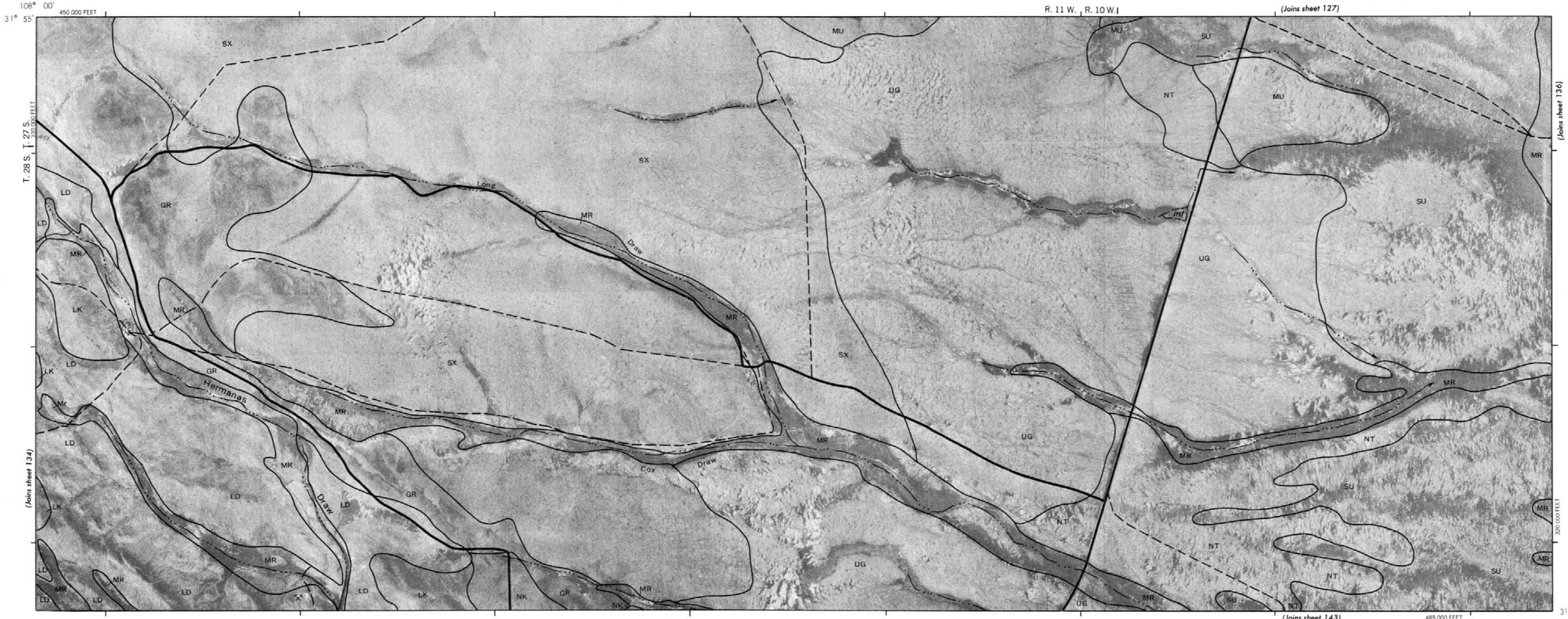
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974 1975 and 1976 U S Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system Land division corners if shown are approximately positioned

N



1 3/4 1/2 1/4 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24000

136

N

1 ¾ ½ ¼ 0 1 2 Miles

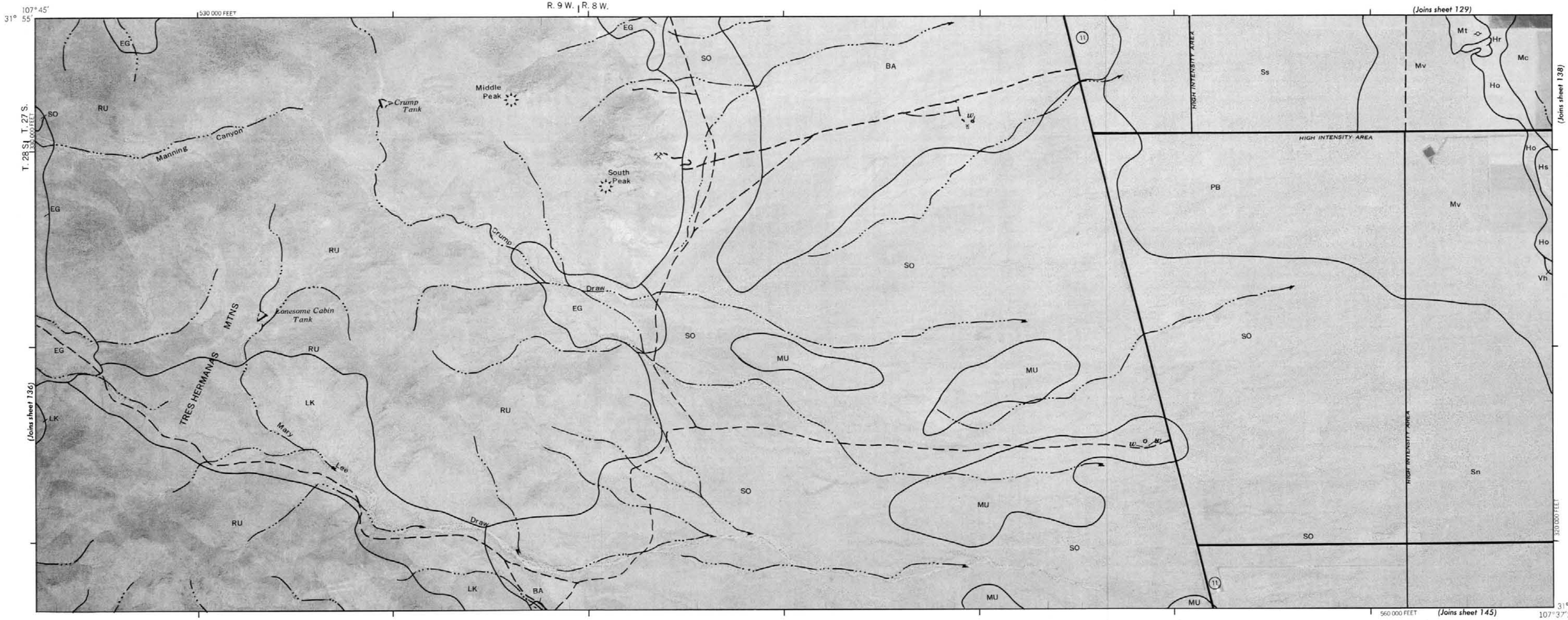
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

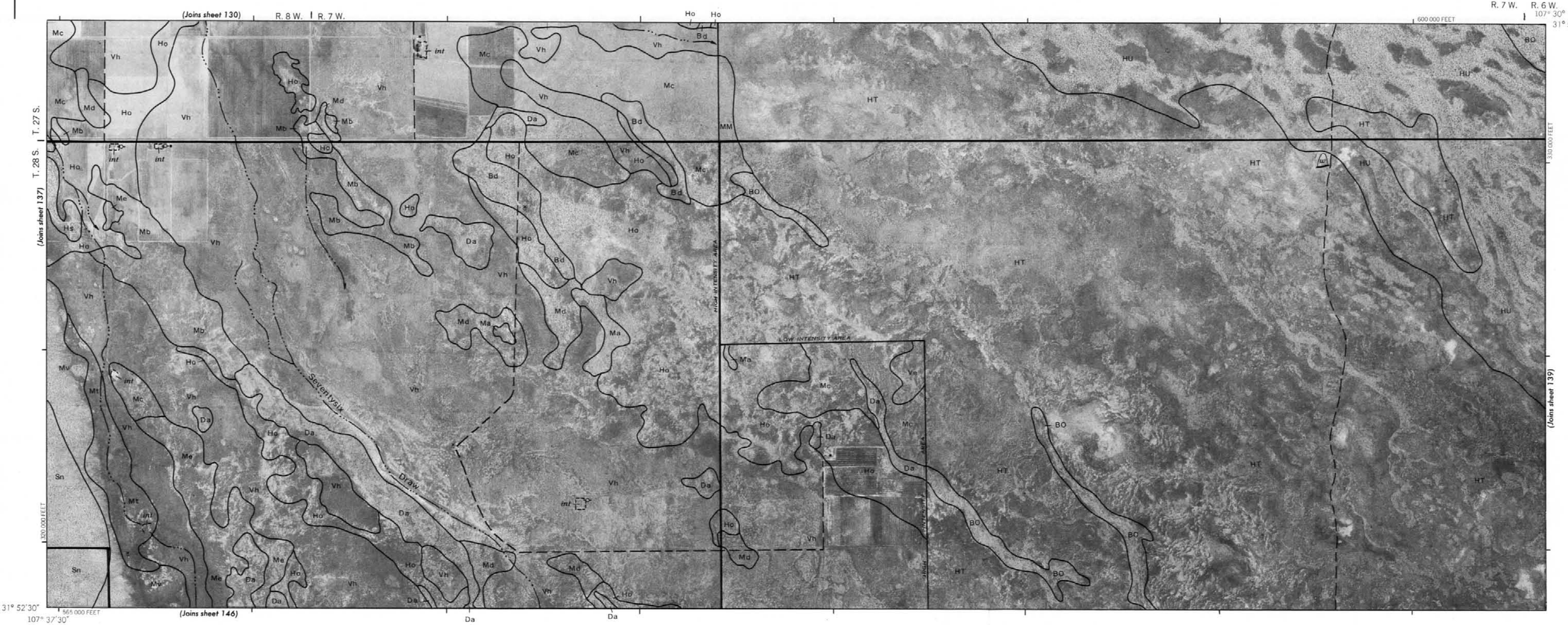
N



Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet



Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

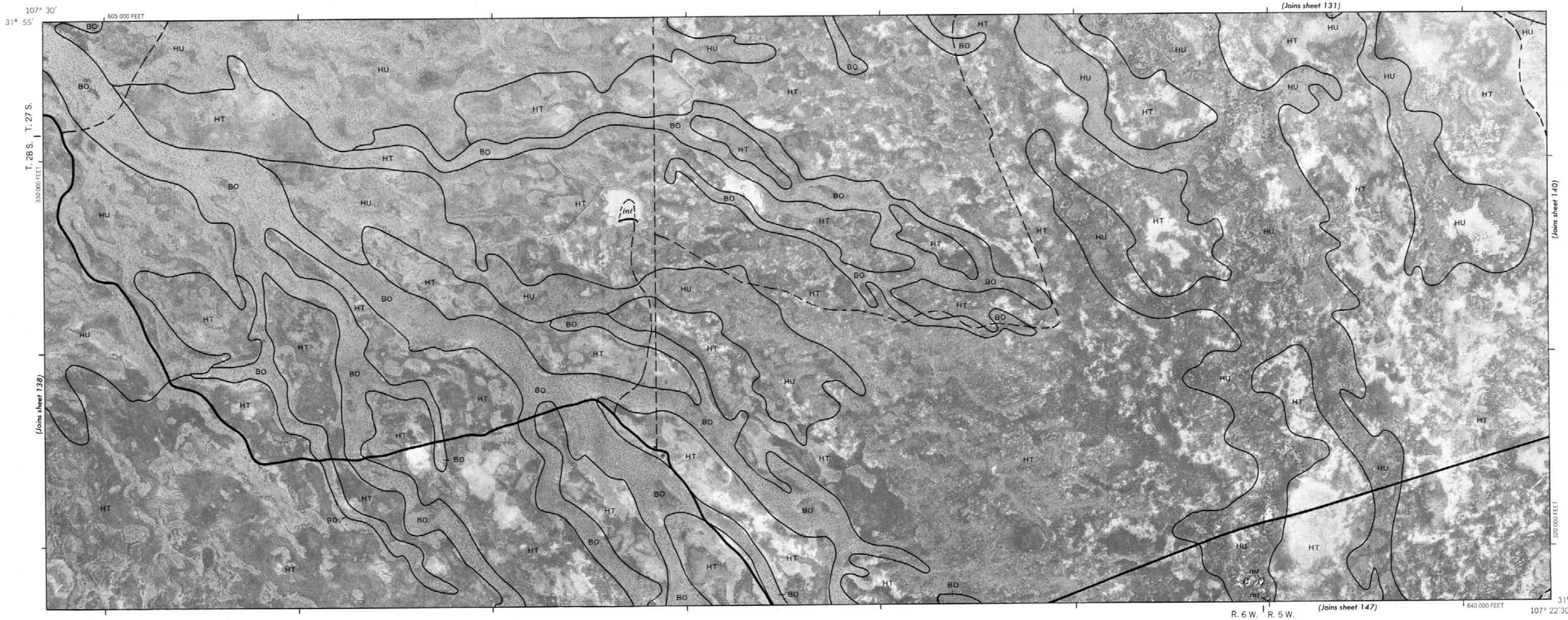
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 139

139

N



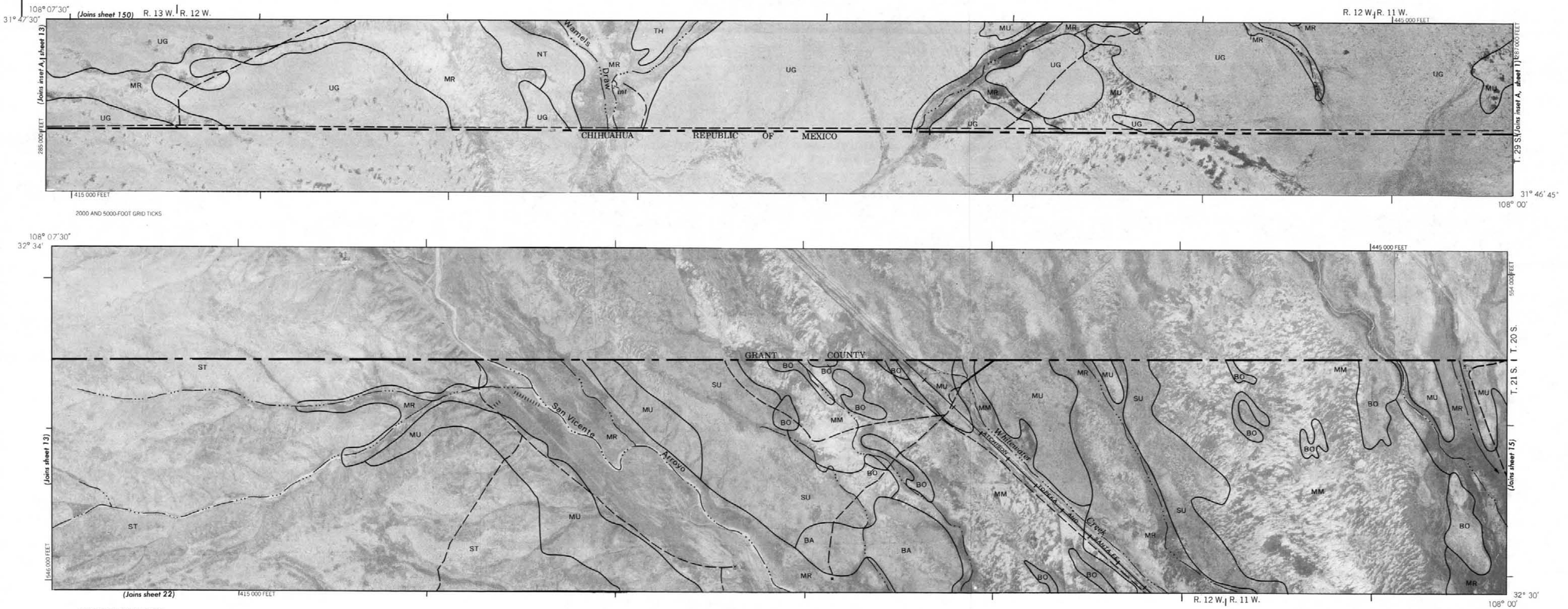
This map was compiled on 1924, 1925 and 1926. U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 14

N

INSET A



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

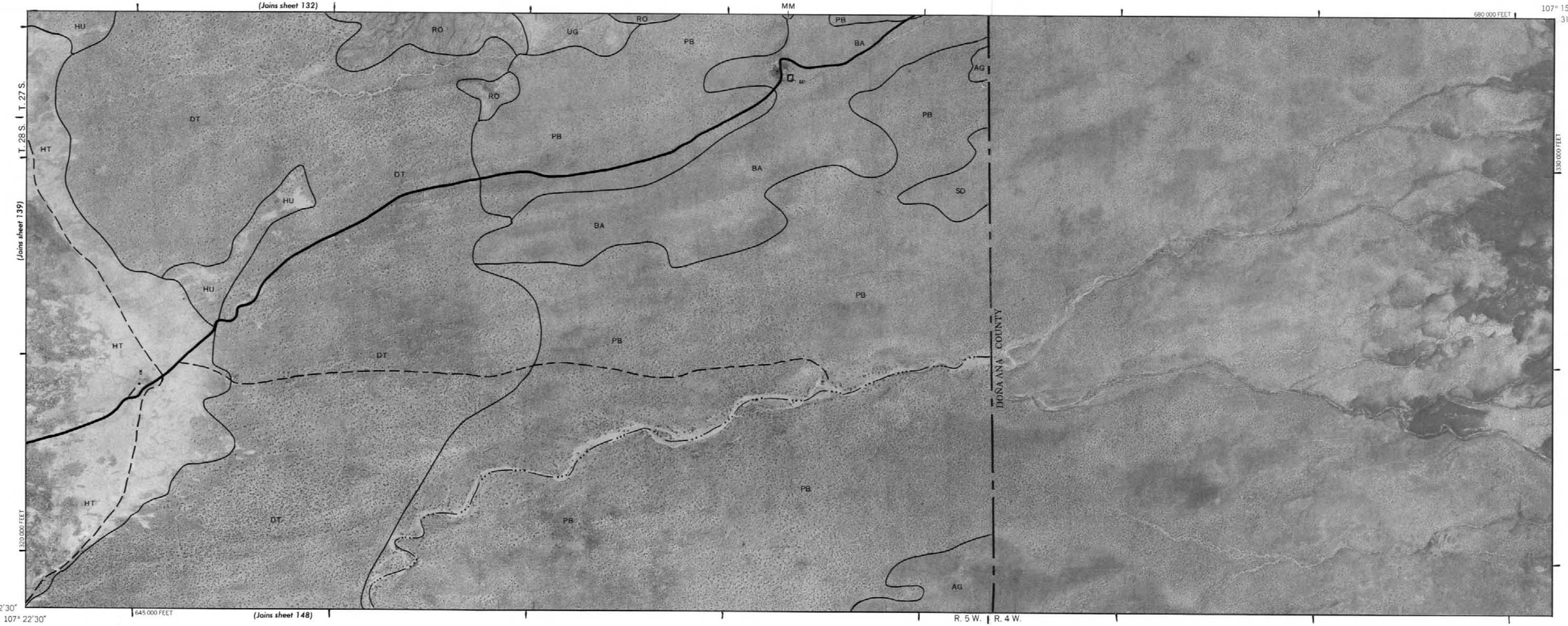
Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 140



Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

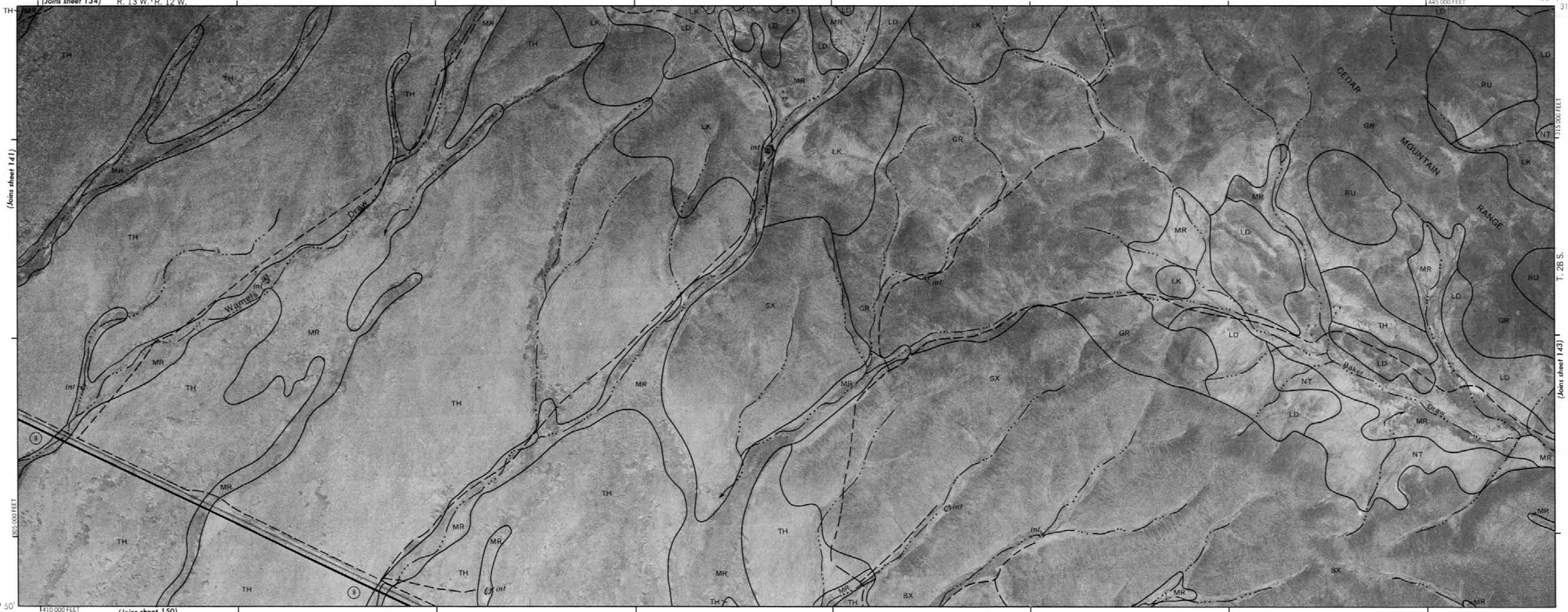
N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 144

N

1 ¾ ½ ¼ 0 1 2 Miles

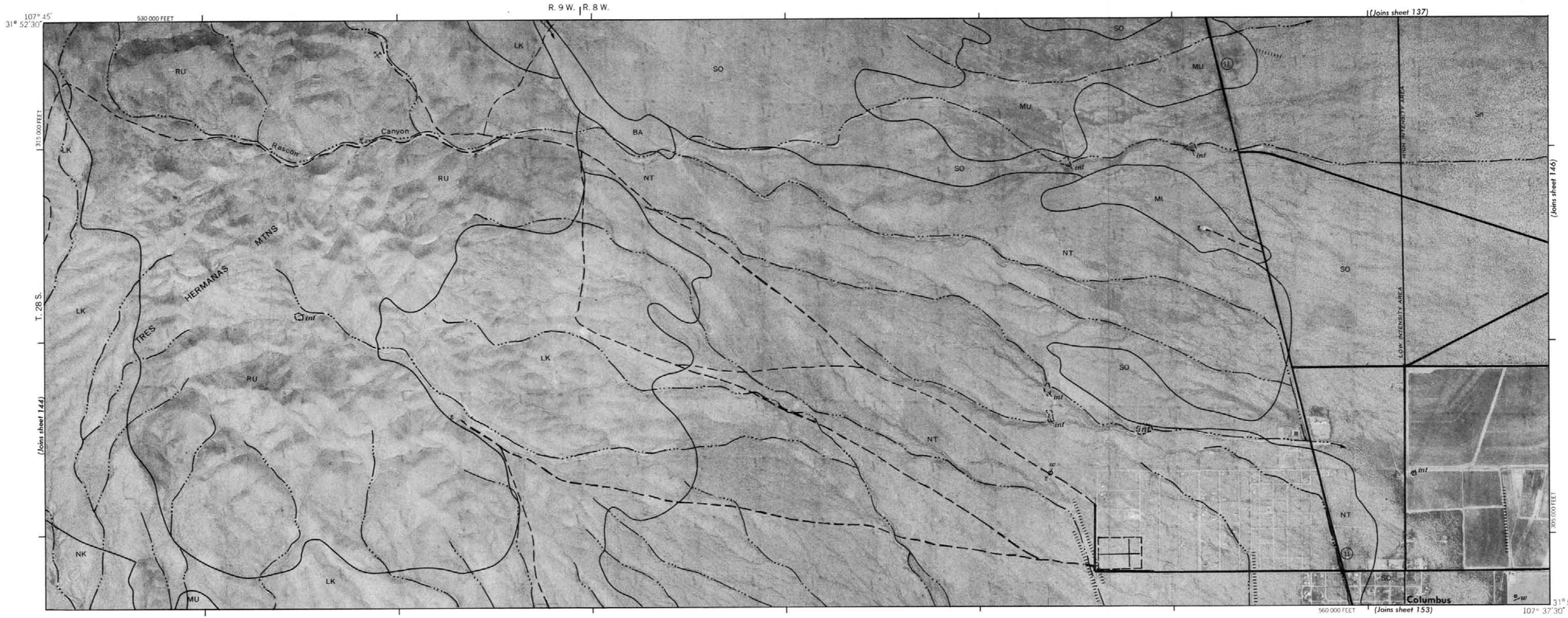
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

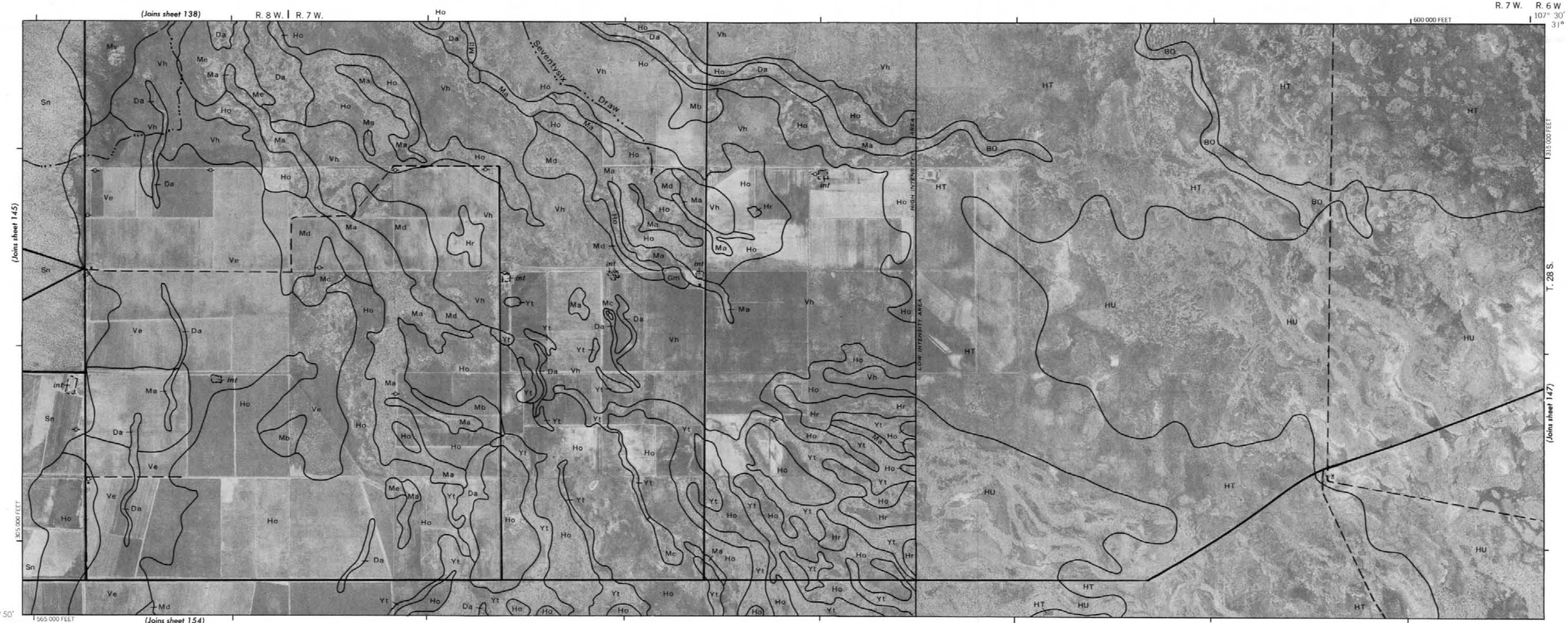
N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000



1 ¾ ½ ¼ 0 1 2 Miles

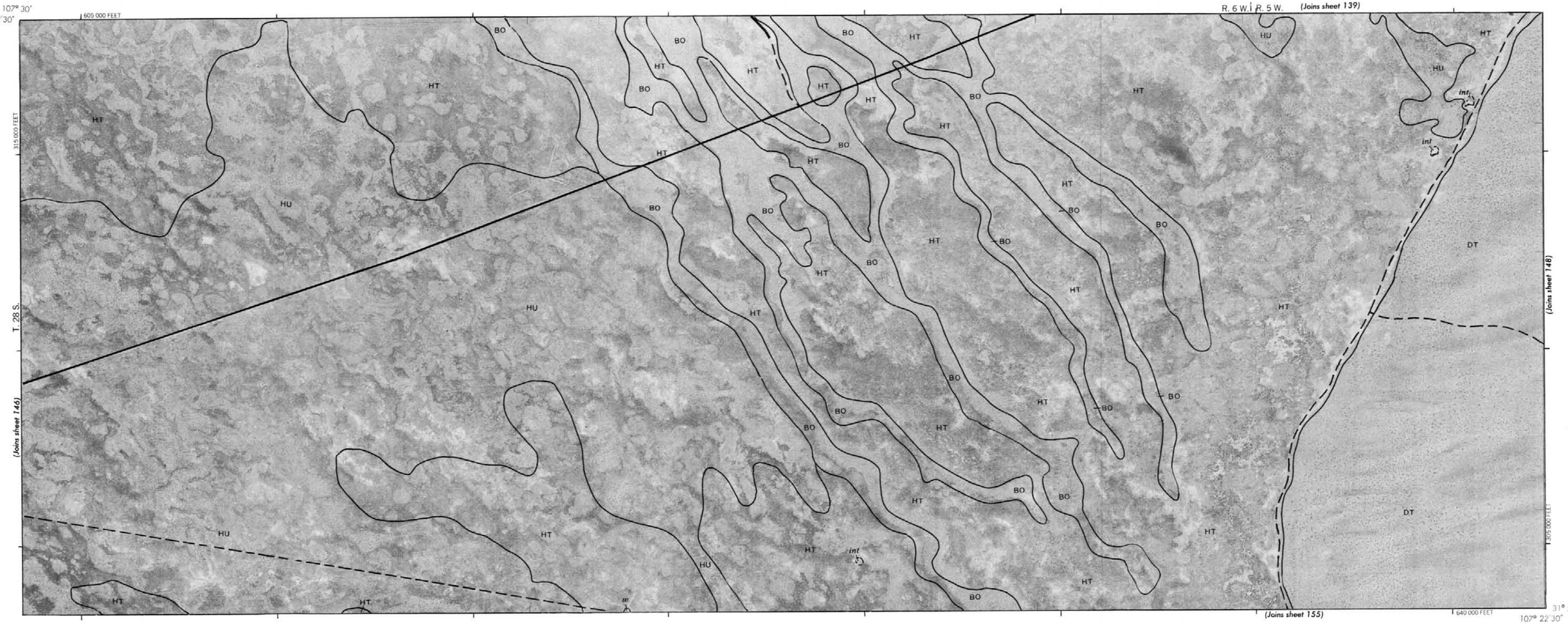
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-feet grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

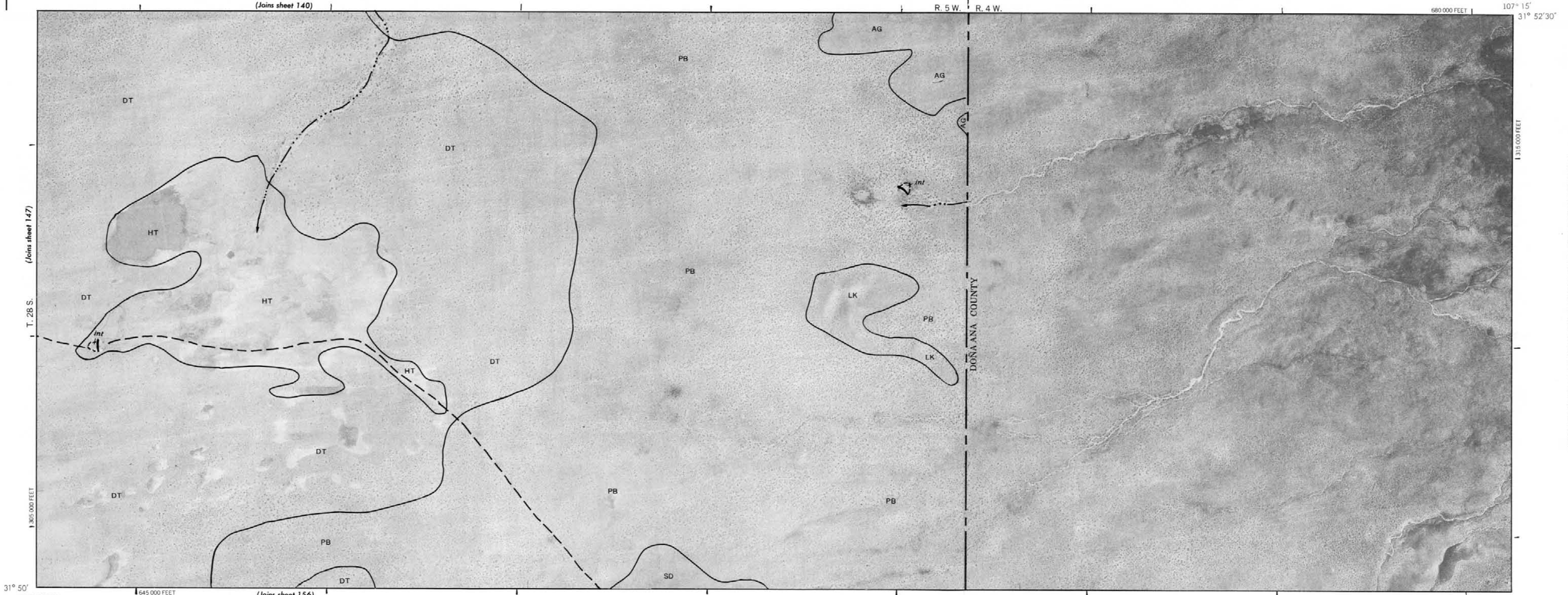
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

(148)

N

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 148



1 ¾ ½ ¼ 0 1 2 Miles

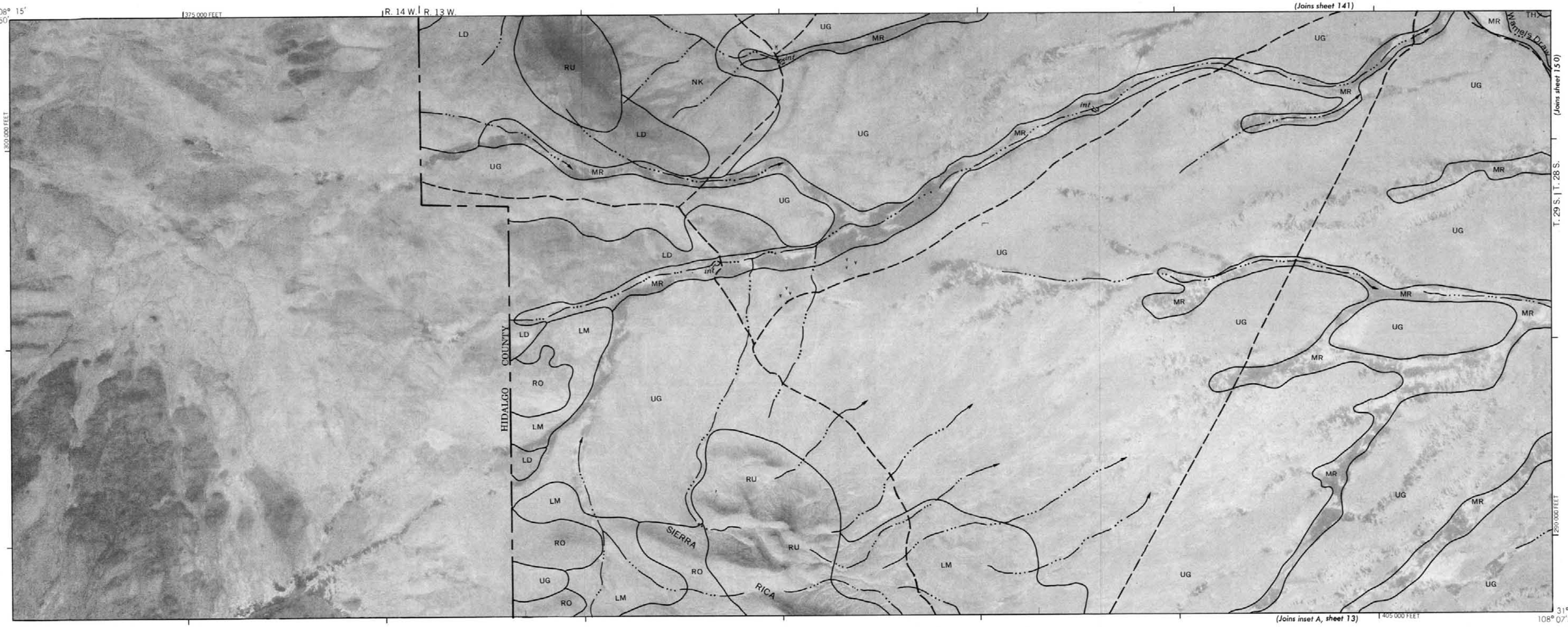
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



Scale 1:24000

N

108° 00'
32° 32'30"
450 000 FEET
560 000 FEET

(Joins sheet 7)

(Joins sheet 14)

(Joins sheet 16)

T. 21 S.
T. 20 S.

GRANT COUNTY

R. 11 W.
R. 10 W.

(Joins sheet 23)

485 000 FEET
32° 30'
107° 52'30"

Mimbres River

180

MU MR UG AV MM RE HT NK LD UP NK SU

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This map was compiled on 1974, 1975 and 1976. U.S. Department of The Interior, Geological Survey, orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000 foot grid ticks based on state coordinate system Land division corners, if shown, are approximately positioned

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

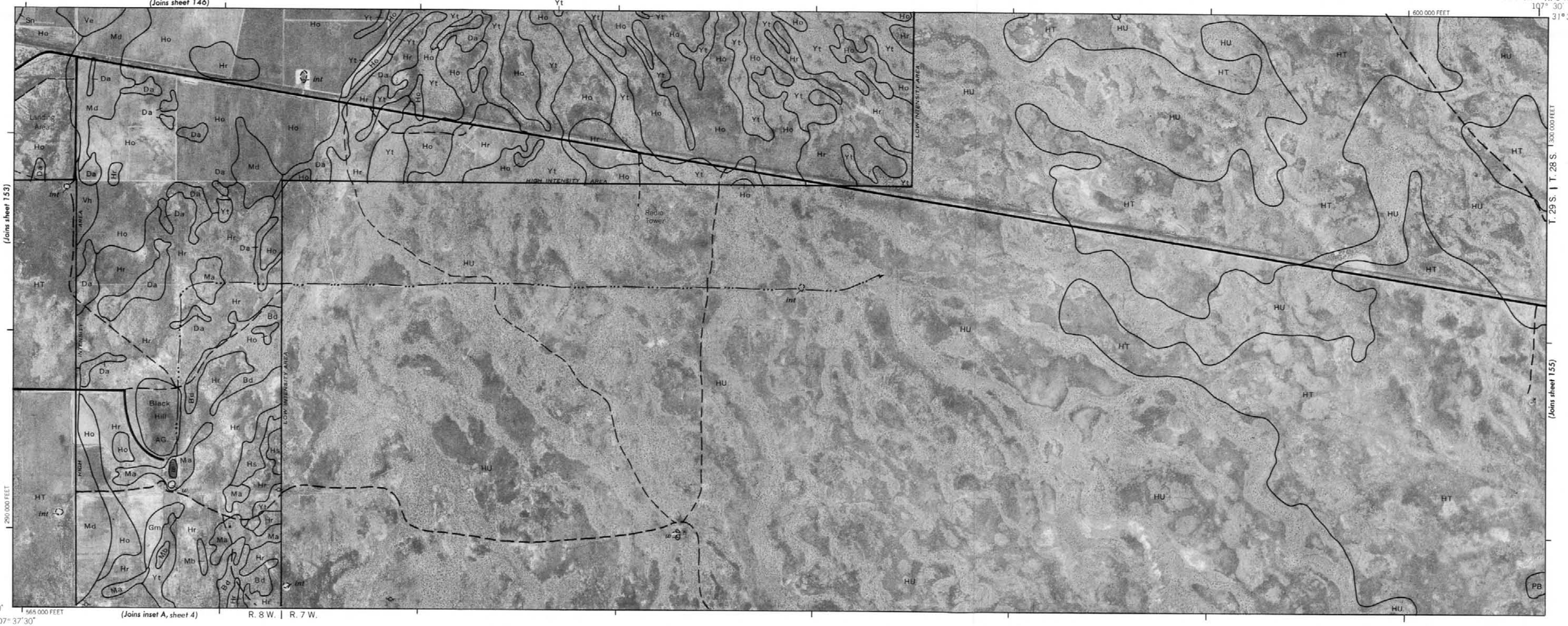
N

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24000

N



Scale 1:24000

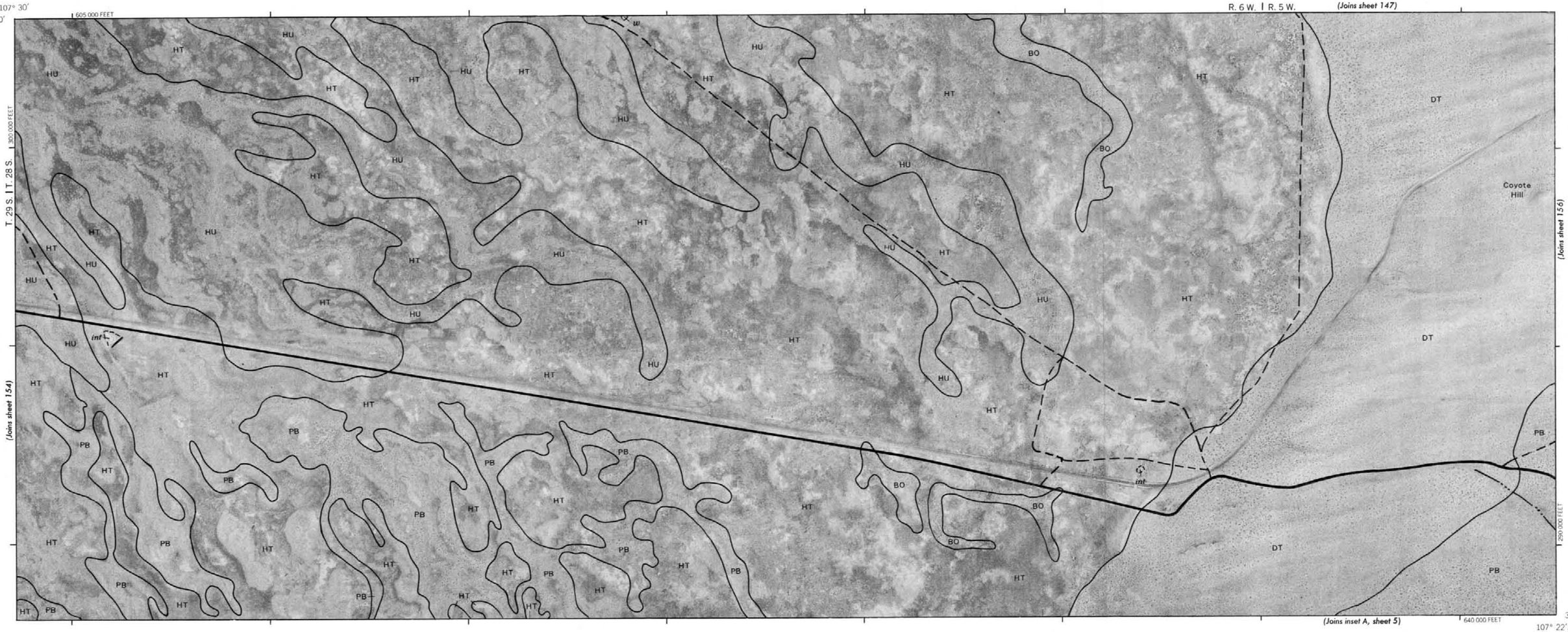
1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 156

N

(Joins sheet 148)

R. 5 W.

107° 15'

31° 50'

680 000 FEET

T. 28 S.

T. 29 S.

(Joins sheet 155)

290 000 FEET

300 000 FEET

DONA ANA COUNTY

PB

DT

SD

AG

LK

SO

int

31° 47' 30"

107° 22' 30"

645 000 FEET

(Joins inset A, sheet 6)

1 ¾ ½ ¼ 0 1 2 Miles

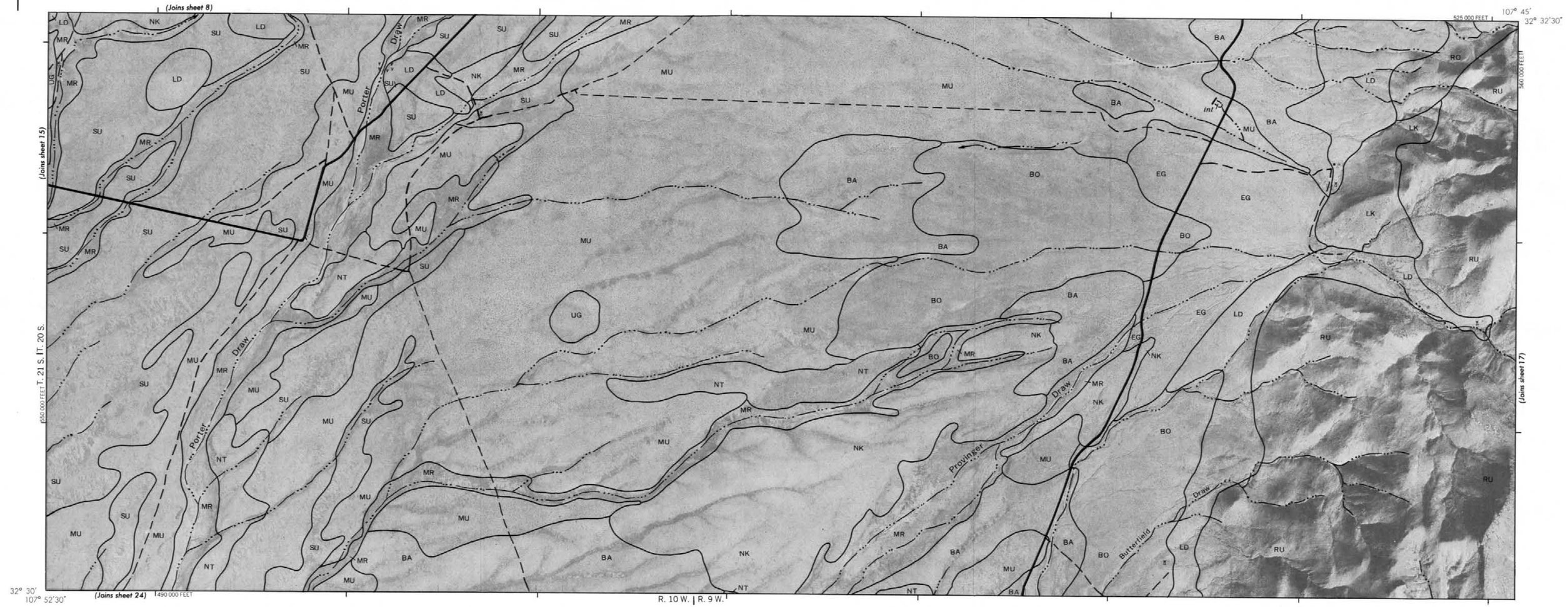
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 16



Scale 1:24000

5000 4000 3000 2000 1000 0 5000 10000 Feet

1 ¾ ½ ¼ 0 1 2 Miles

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N

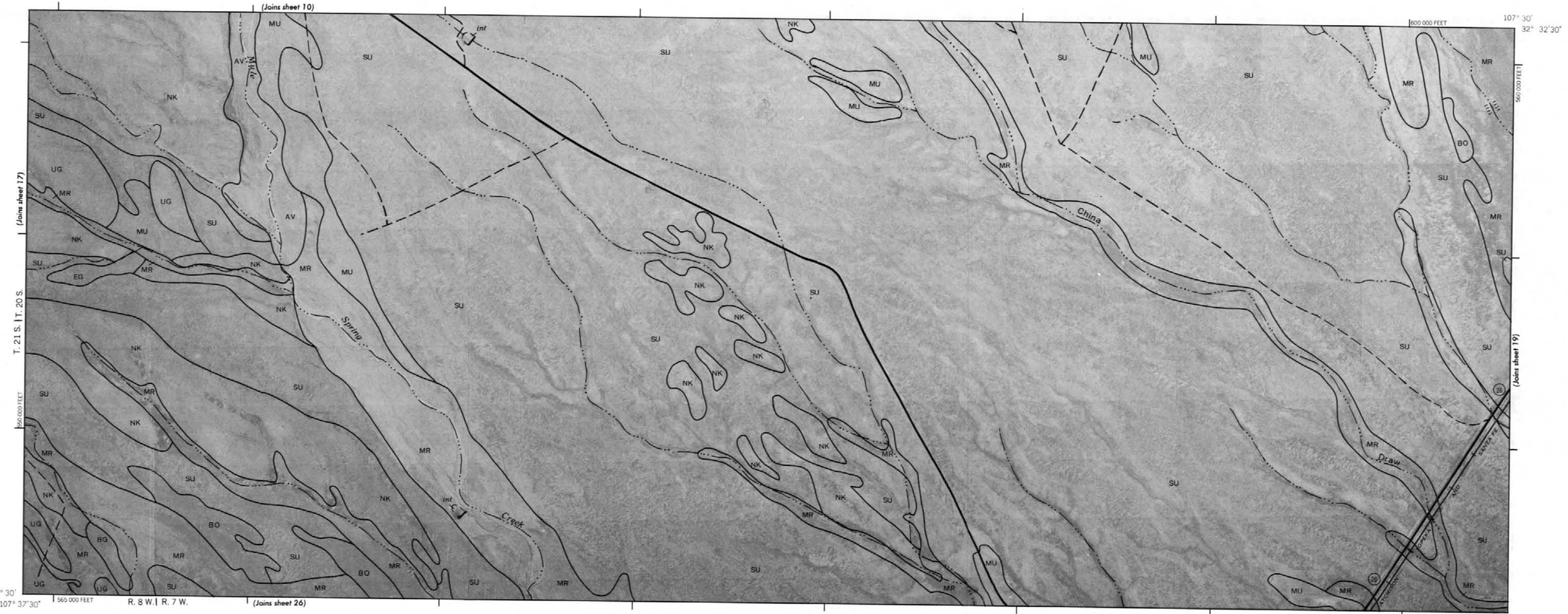
Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

N

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 18



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

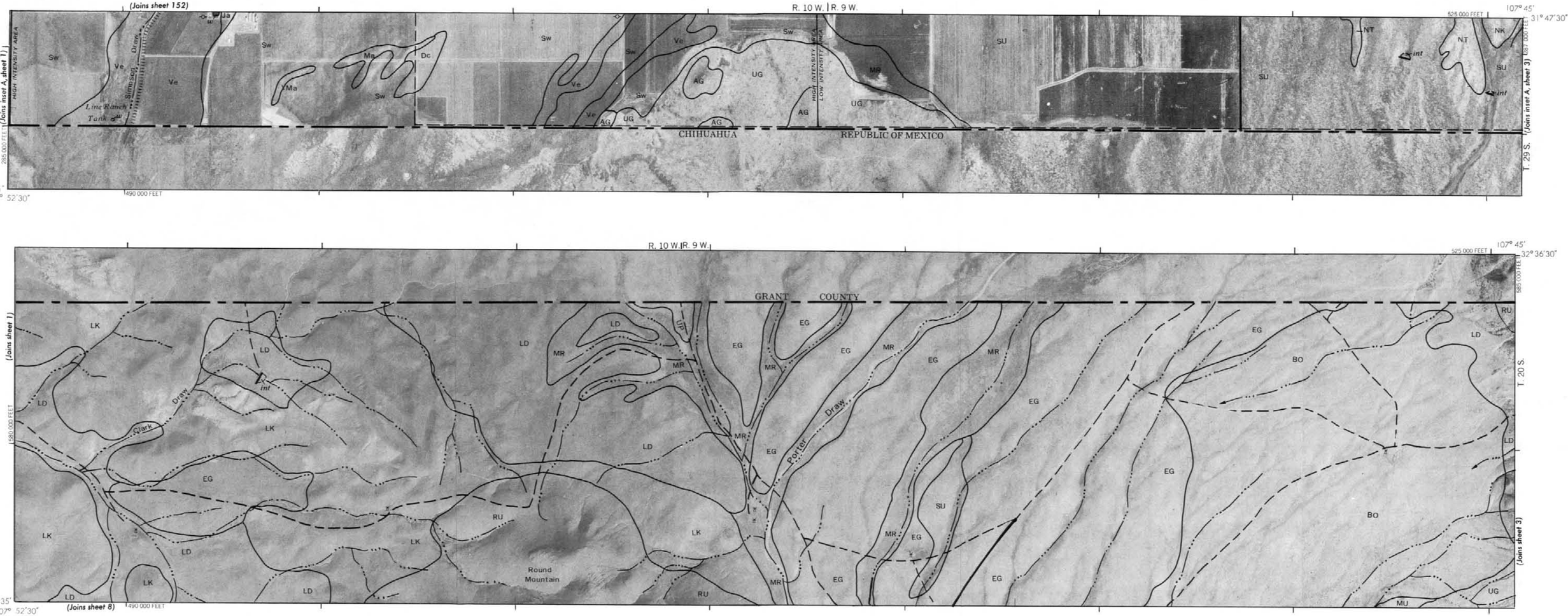
This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

This map was compiled on 1974 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 2

N

INSET A



1 3/4 1/2 1/4 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey photographs by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

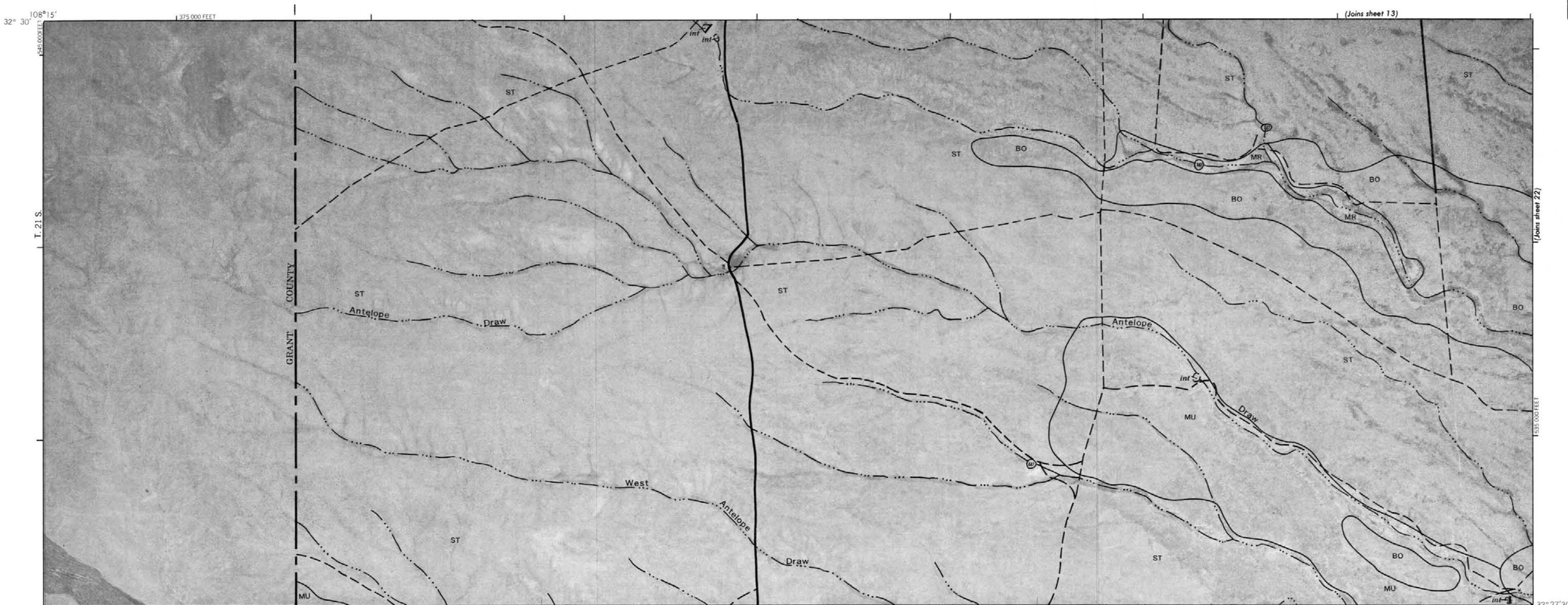
5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974 and 1976 aerial photography by the U.S. Department of The Interior Geological Survey

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

Soil Conservation Service and cooperating agencies

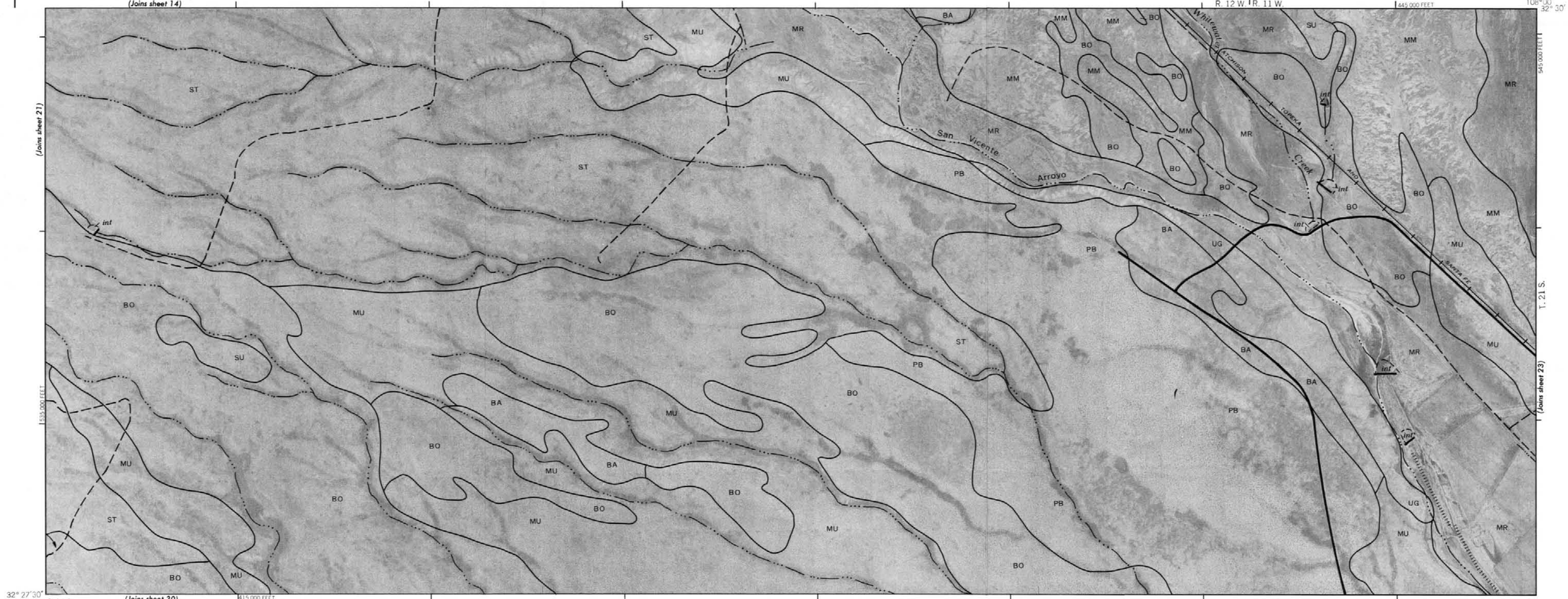
N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000



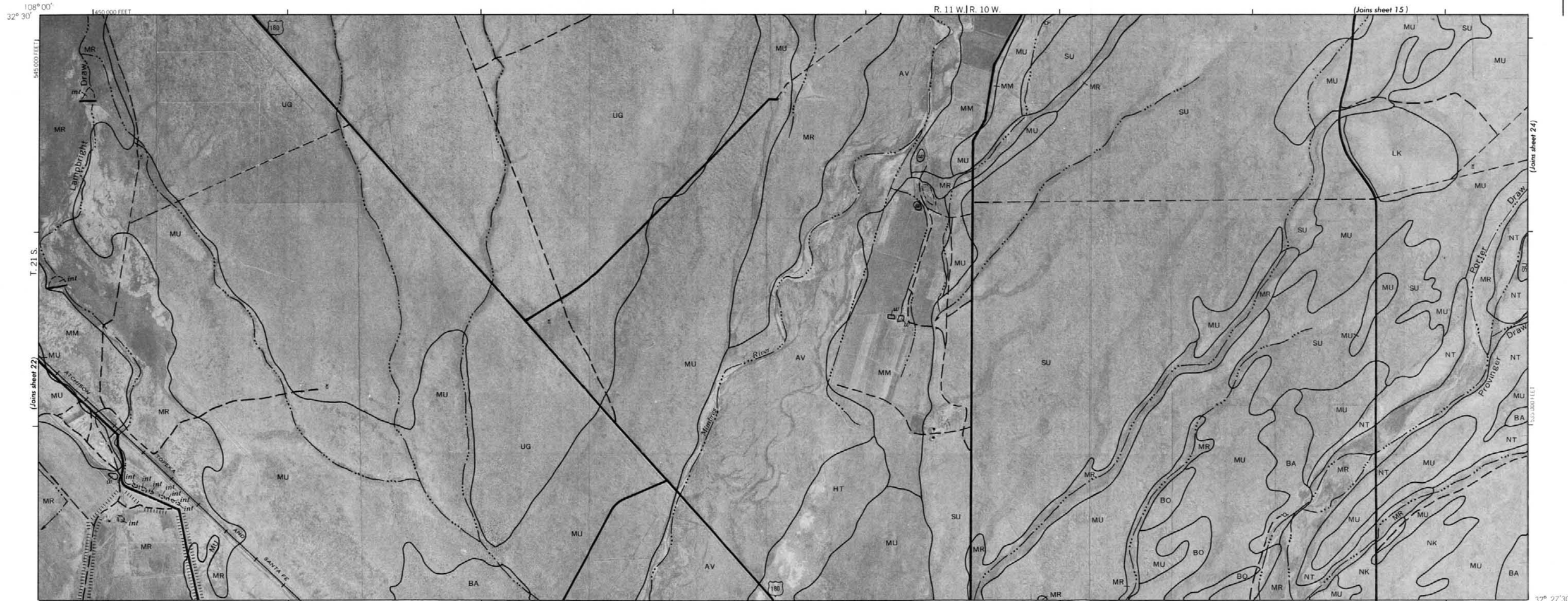
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976. U.S. Department of the Interior, Geological Survey phototopography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies



This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N

1 ¾ ½ ¼ 0 1 2 Miles

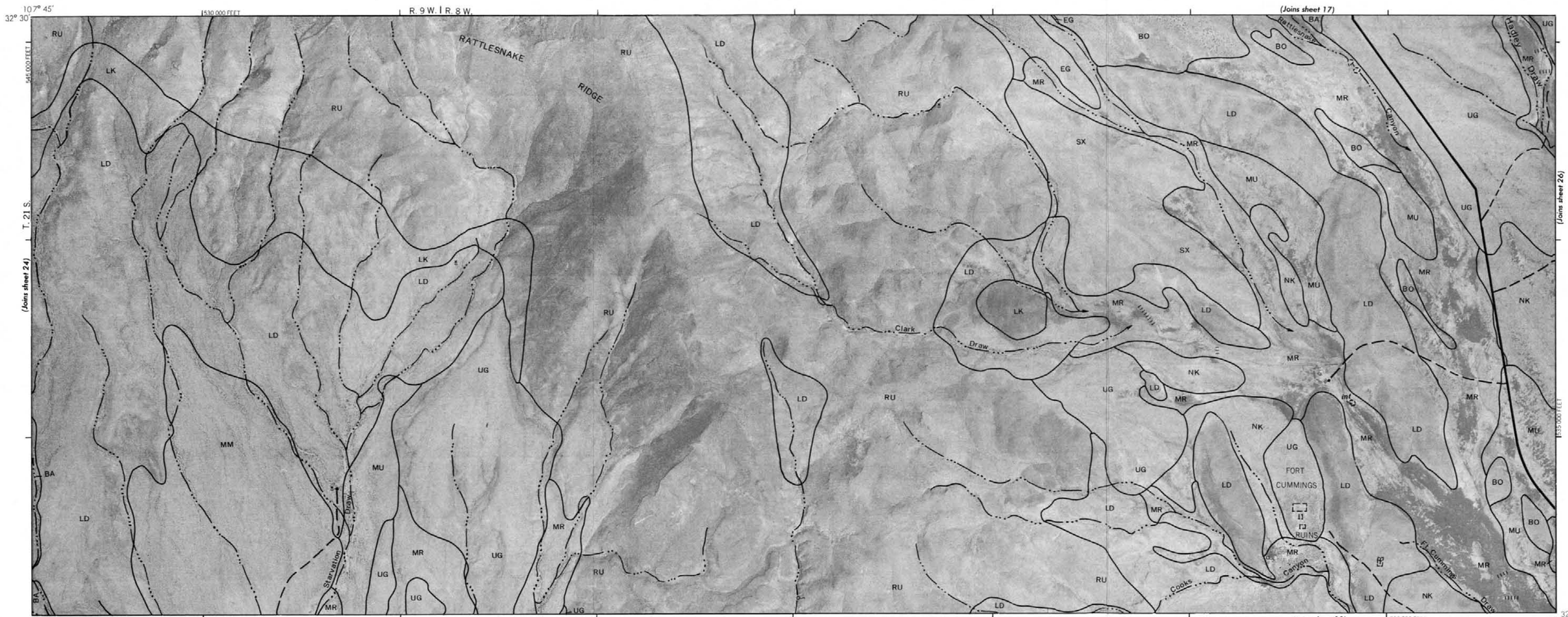
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior Geological Survey orthophotography By the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system Land division corners, if shown, are approximately positioned

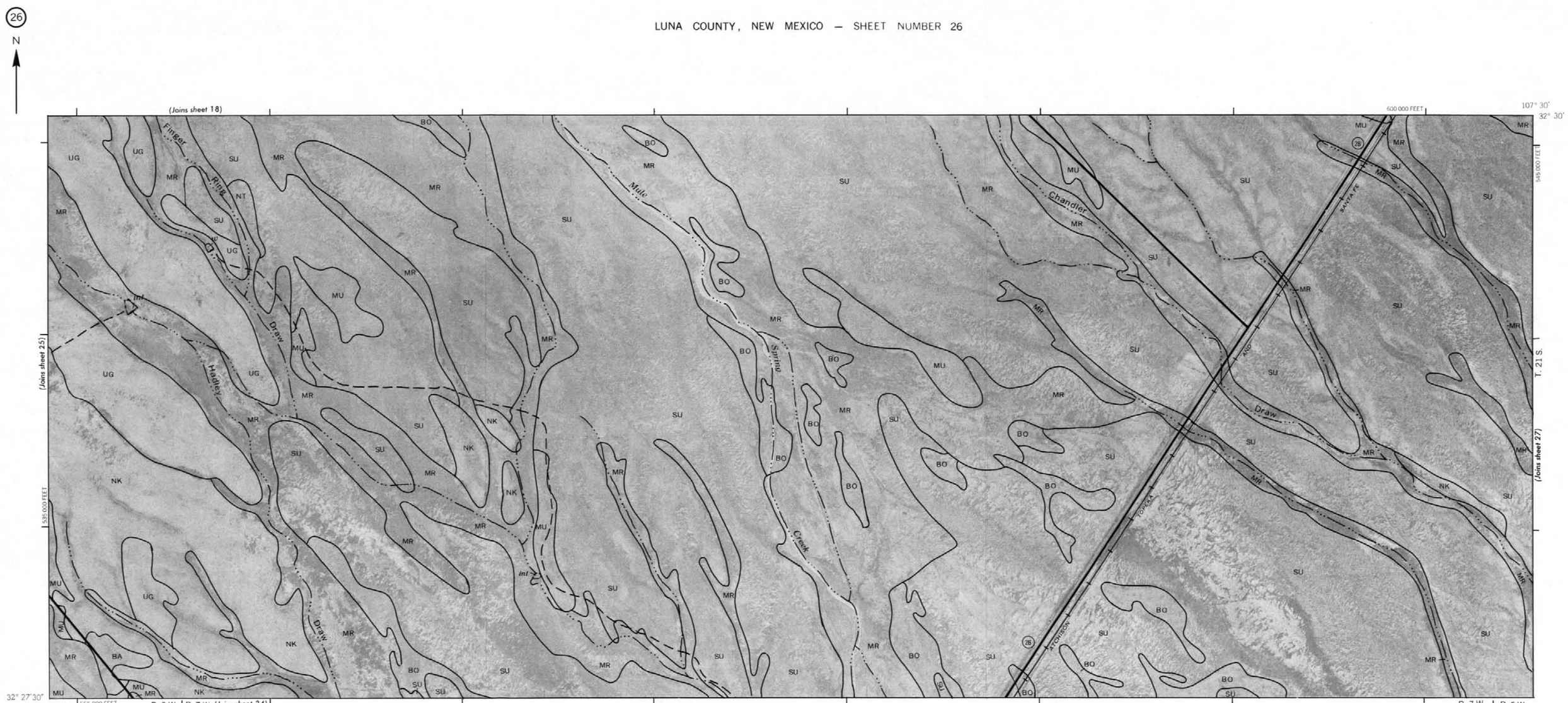
N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000



5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.
This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

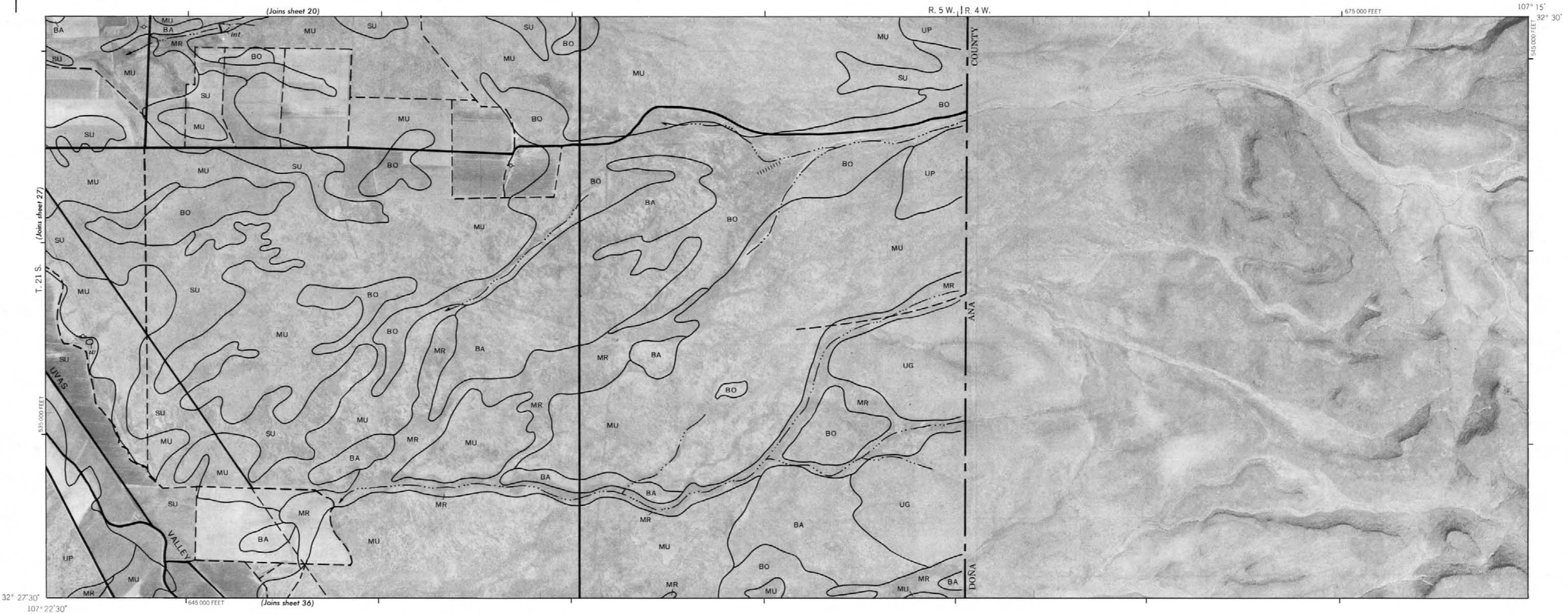
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 28



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system Land division corners, if shown, are approximately positioned

N

108° 15'
32° 27'30"
375,000 FEET
530,000 FEET
(Joins sheet 21)
(Joins sheet 30)
405,000 FEET
(Joins sheet 37)
R. 14 W. | R. 13 W.
R. 13 W. | R. 12 W.
32° 25'
108° 7'30"
T. 22 S. | T. 21 S.

GRANT COUNTY

West Antelope Draw

Cow Springs Draw

Rattlesnake Tank

MU SU ST RU UG LD LK MR TU BO LU

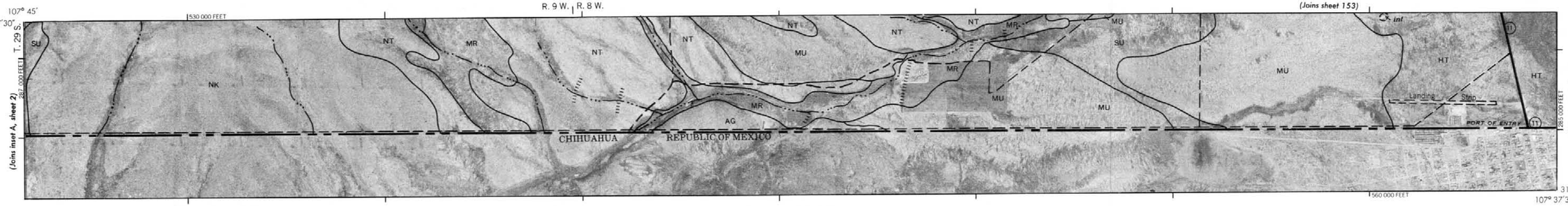
1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 3

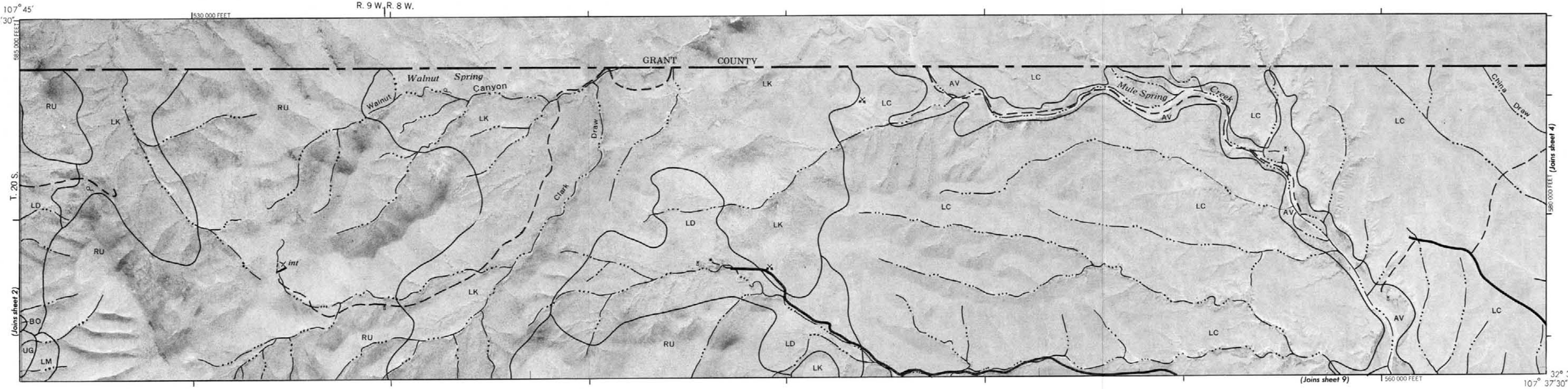
3

N

INSET A



2000 AND 5000-FOOT GRID TICKS



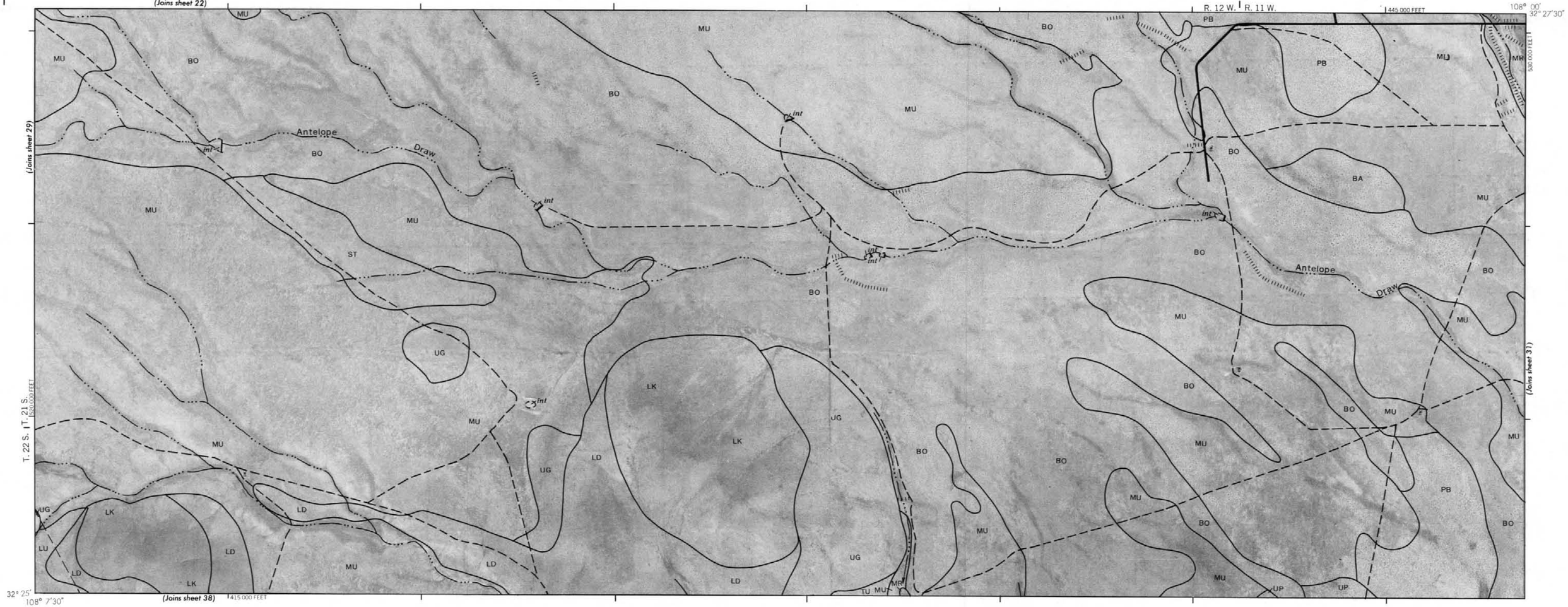
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. 5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 30



2 Miles 1 0 1

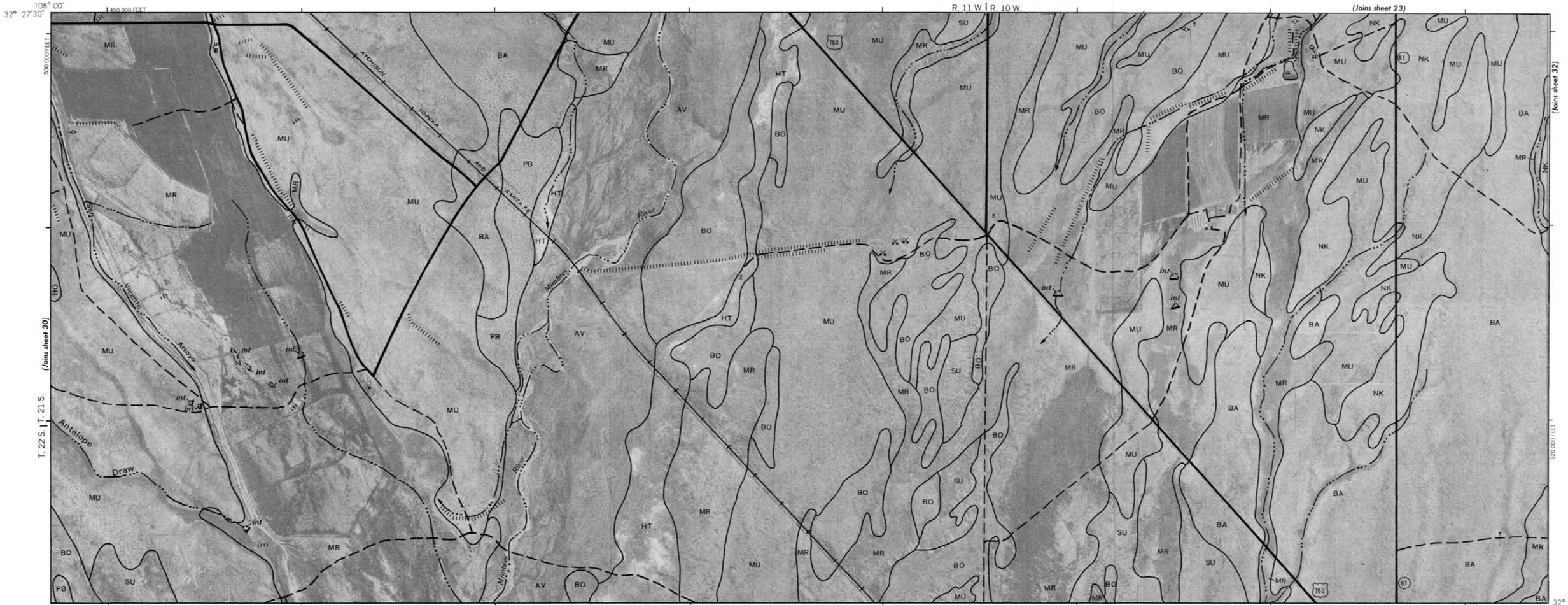
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975, and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N

R. 10 W. | R. 9 W.

(Joins sheet 24)

(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 40)

T. 22 S. | T. 21 S.

525 000 FEET

530 000 FEET

490 000 FEET

107° 45'

32° 27' 30"

32° 25'

107° 52' 30"

Butterfield Draw

China Draw

GOAT RIDGE

FLUORITE RIDGE

NK MR BA LD MU RU LK NT int w

Scale 1:24000

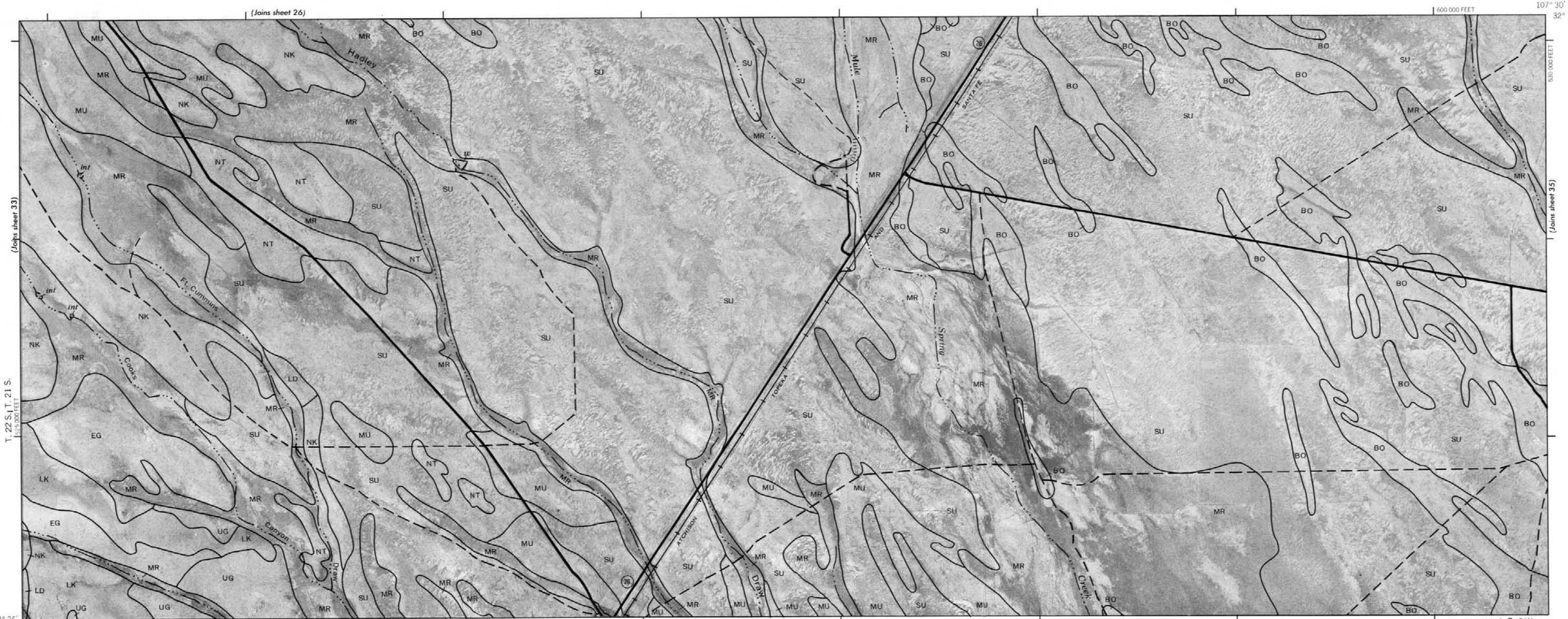
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

This map was compiled on 1974 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. 5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

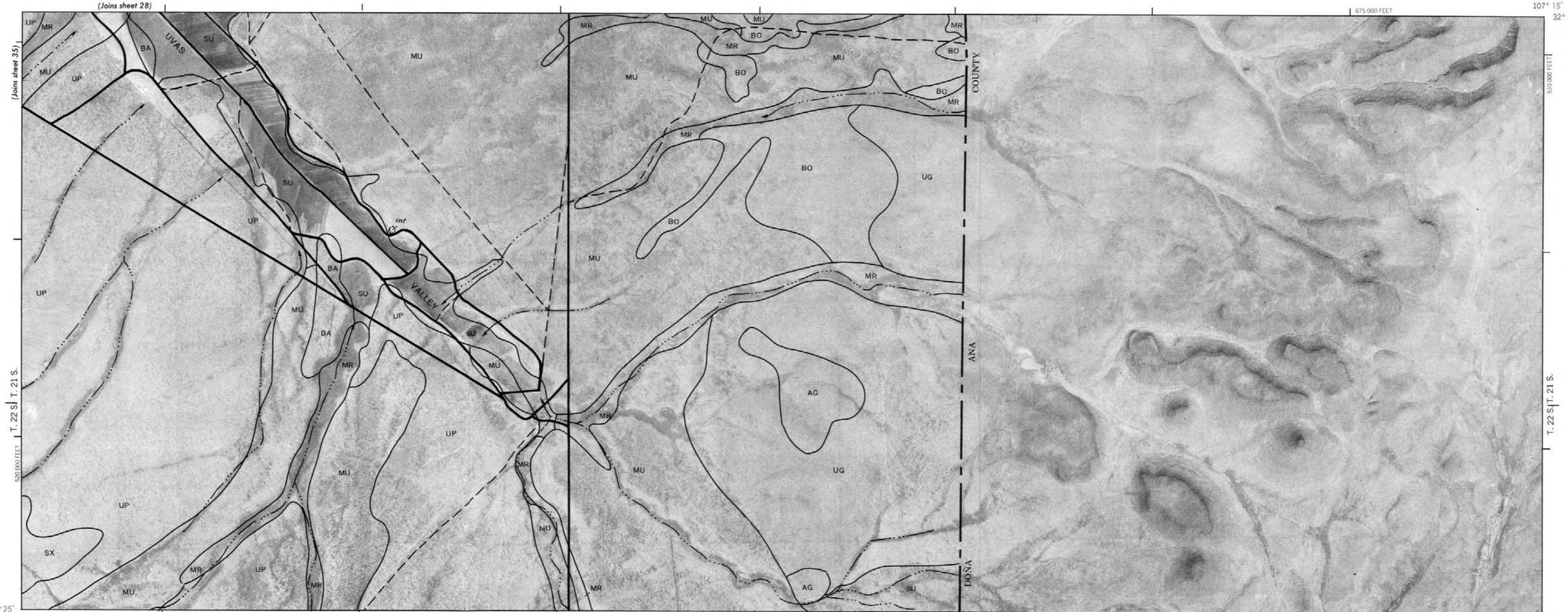
Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N



Scale 1:24000

5,000 foot grid ticks based on state coordinate system: Land division corners, if shown, are approximately positioned

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

108°15'
375 000 FEET
32°25'
510 000 FEET
T. 22 S.
R. 14 W. | R. 13 W.
405 000 FEET
(Joins sheet 29)
(Joins sheet 38)
(Joins sheet 45)
R. 13 W. | R. 12 W.
32°22'30"
108°07'30"

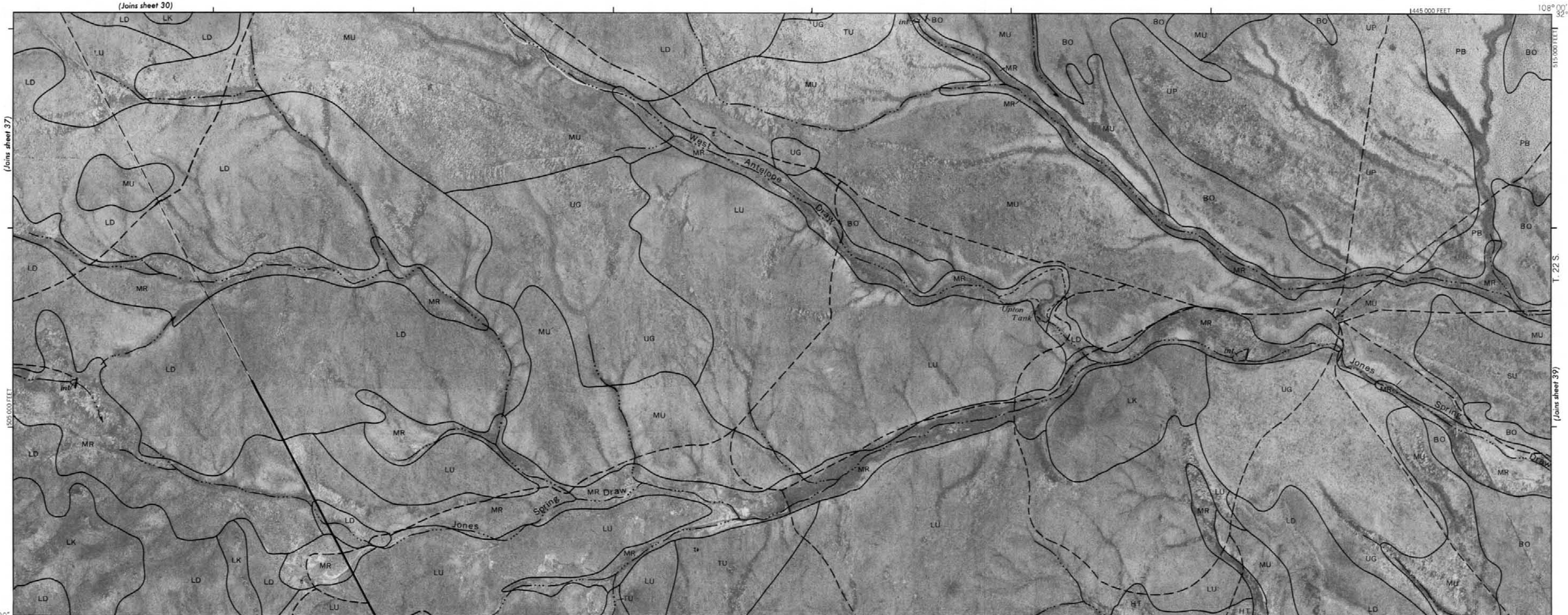
GRANT COUNTY

Walnut Creek
Hay Draw
Thorn Hay Draw Tank
Cow Springs
Springs
Draw

BO
MU
TU
LD
LU
LK
MR
BA
SU

Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet



Scale 1:24000

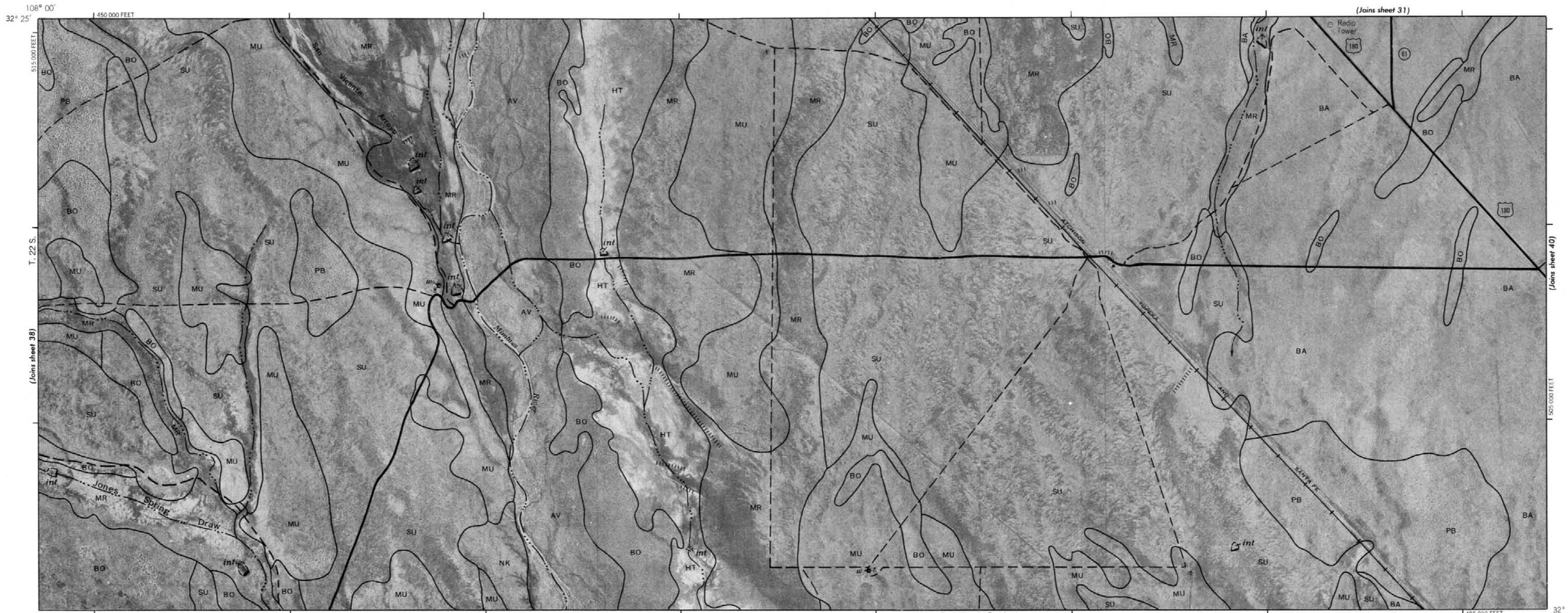
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey or Photobiography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N



Scale 1:24000

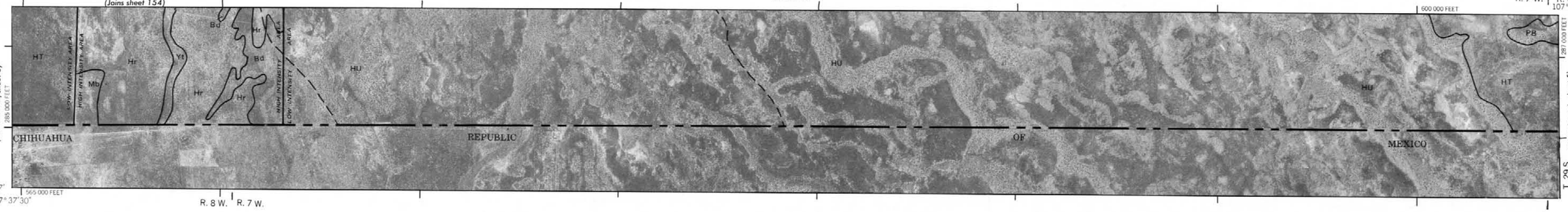
1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

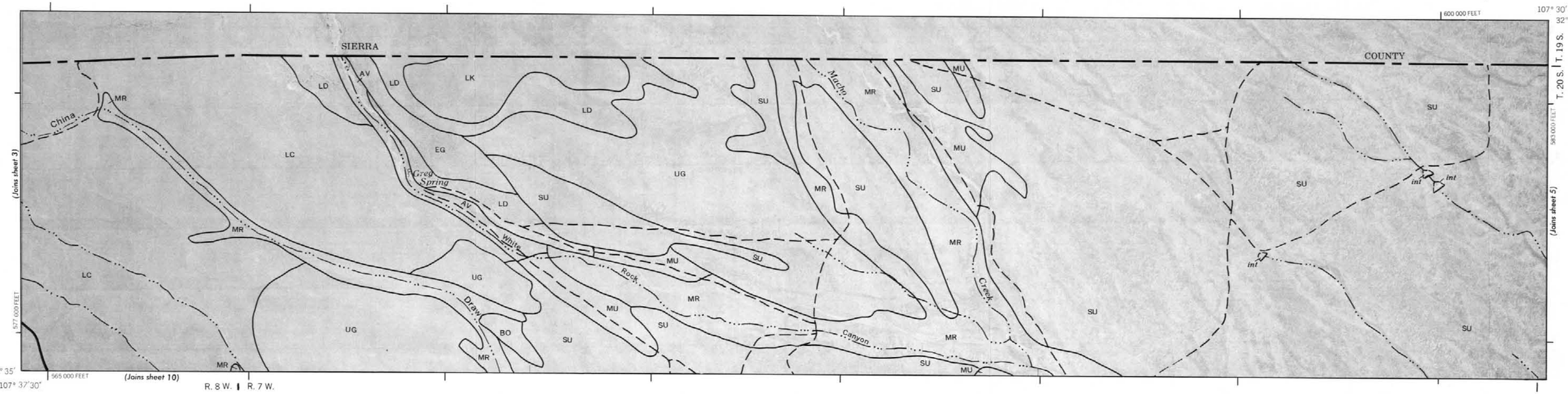
LUNA COUNTY, NEW MEXICO — SHEET NUMBER 4

N

INSET A



2000 AND 5000-FOOT GRID TICKS



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey photomosaic by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

R. 10 W. | R. 9 W.

(Joins sheet 32)

107° 45'

32° 25'

525 000 FEET

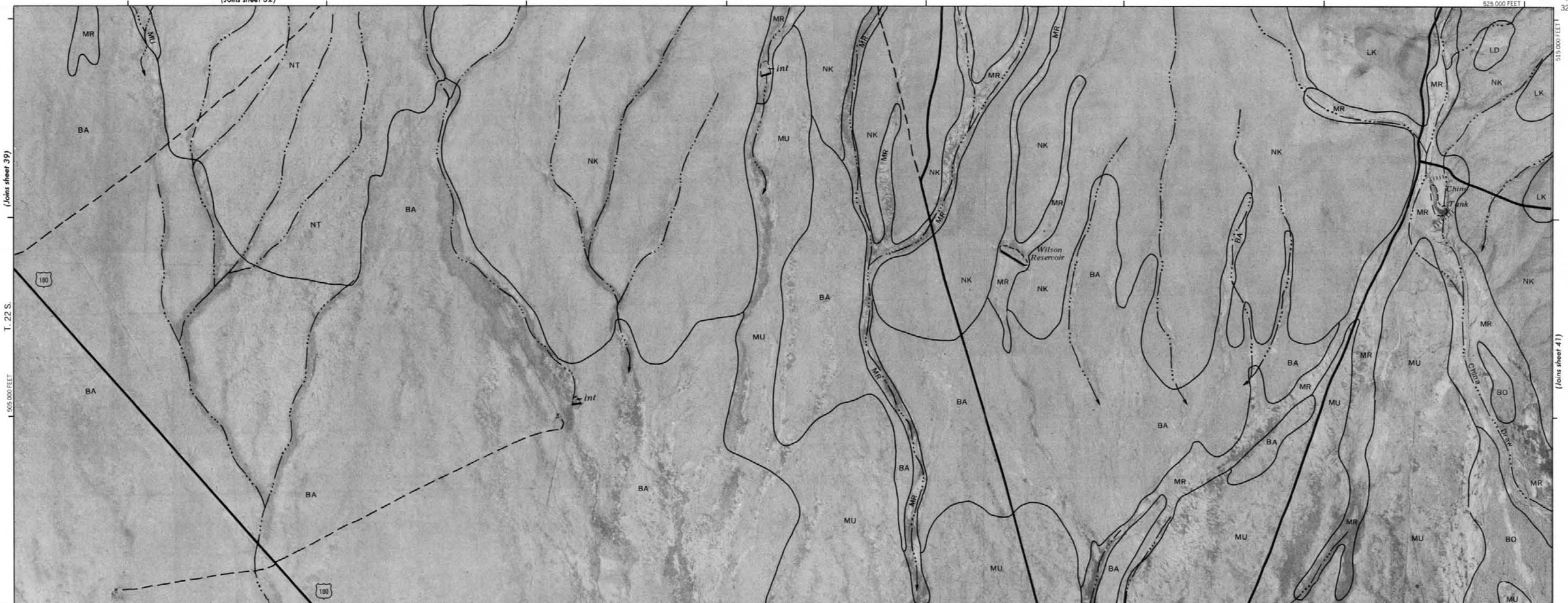
515 000 FEET

(Joins sheet 39)

T. 22 S.

505 000 FEET

(Joins sheet 41)



32° 22'30"

107° 52'30"

490 000 FEET

(Joins sheet 48)

1 ¾ ½ ¼ 0 1 2 Miles

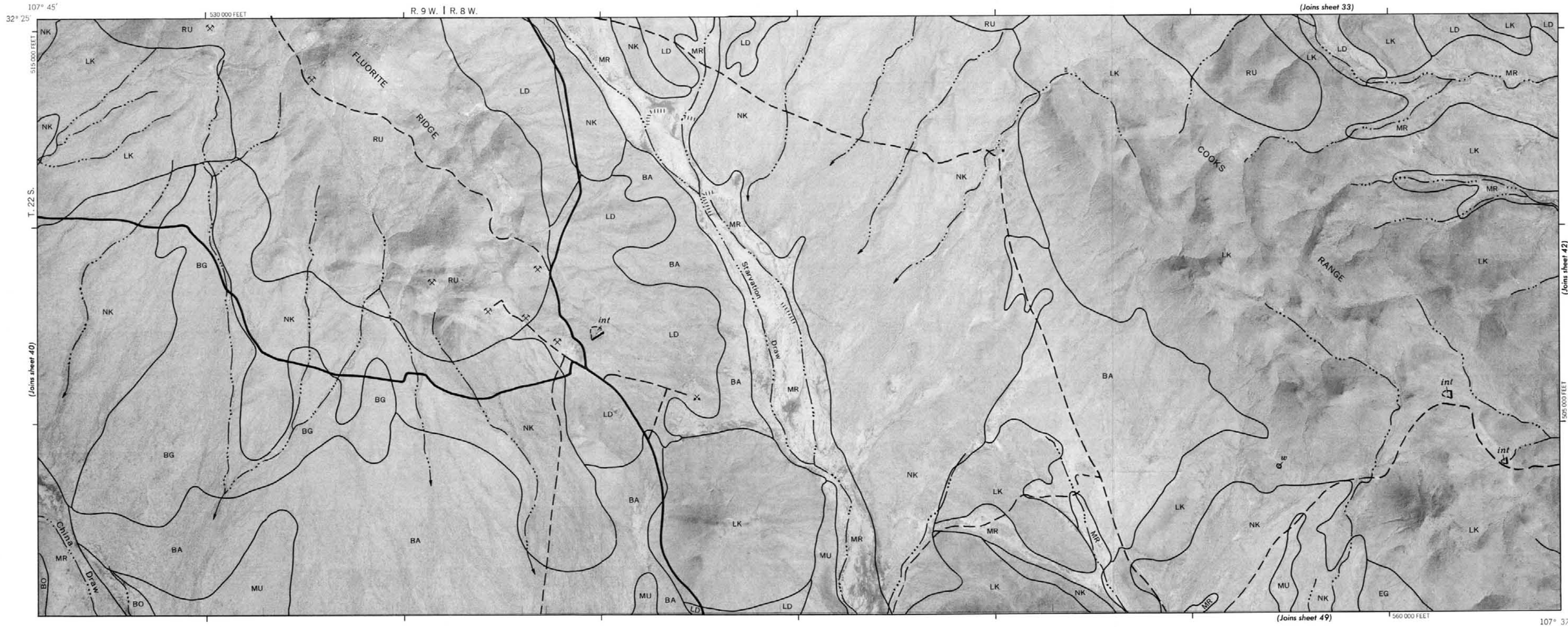
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior Geological Survey orthophotography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system Land division corners, if shown, are approximately positioned

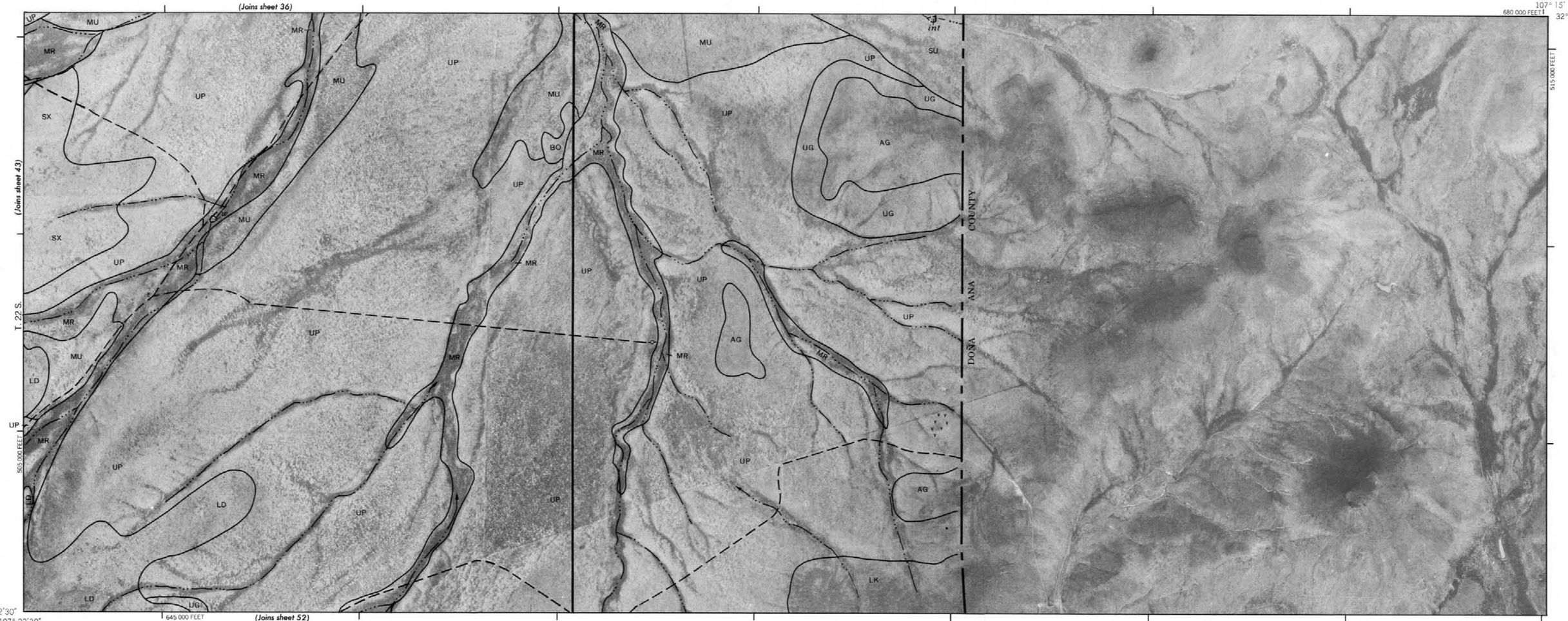
N

Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

N

1 ¾ ½ ¼ 0 1 2 Miles

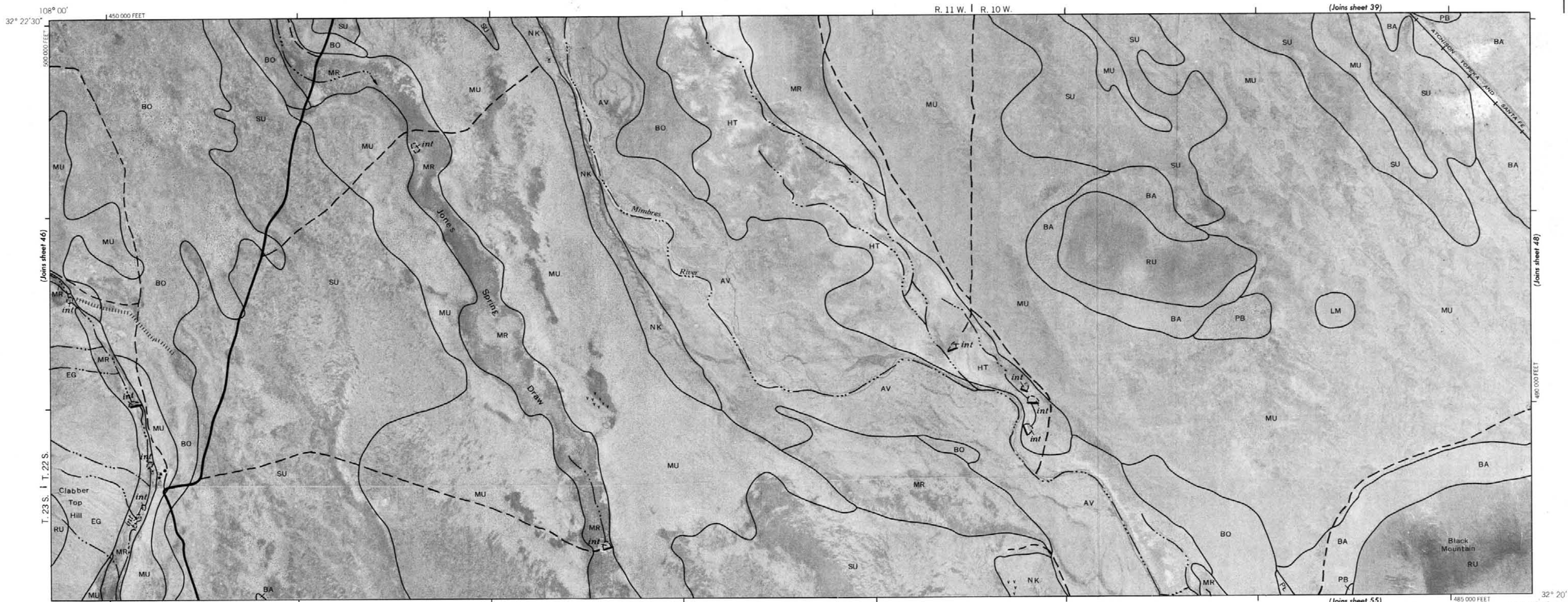
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey photogrammetric by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N

1 ¾ ½ ¼ 0 1 2 Miles

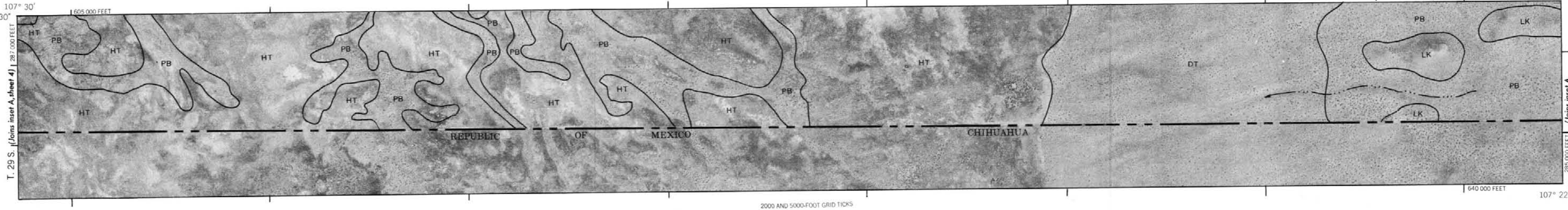
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

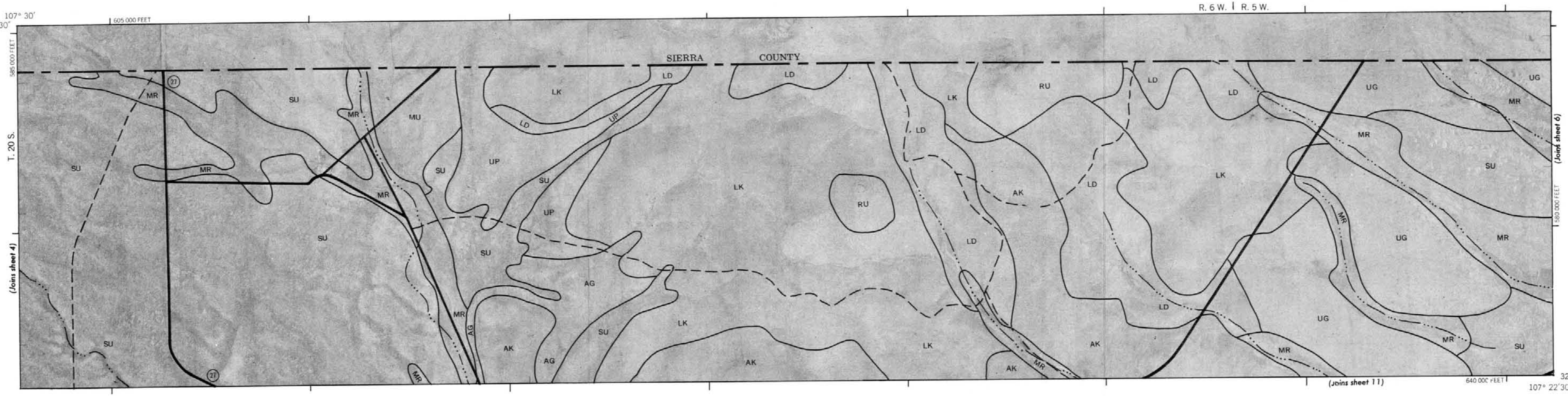
This map was compiled on 1974, 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

INSET A



2000 AND 5000-FOOT GRID TICKS

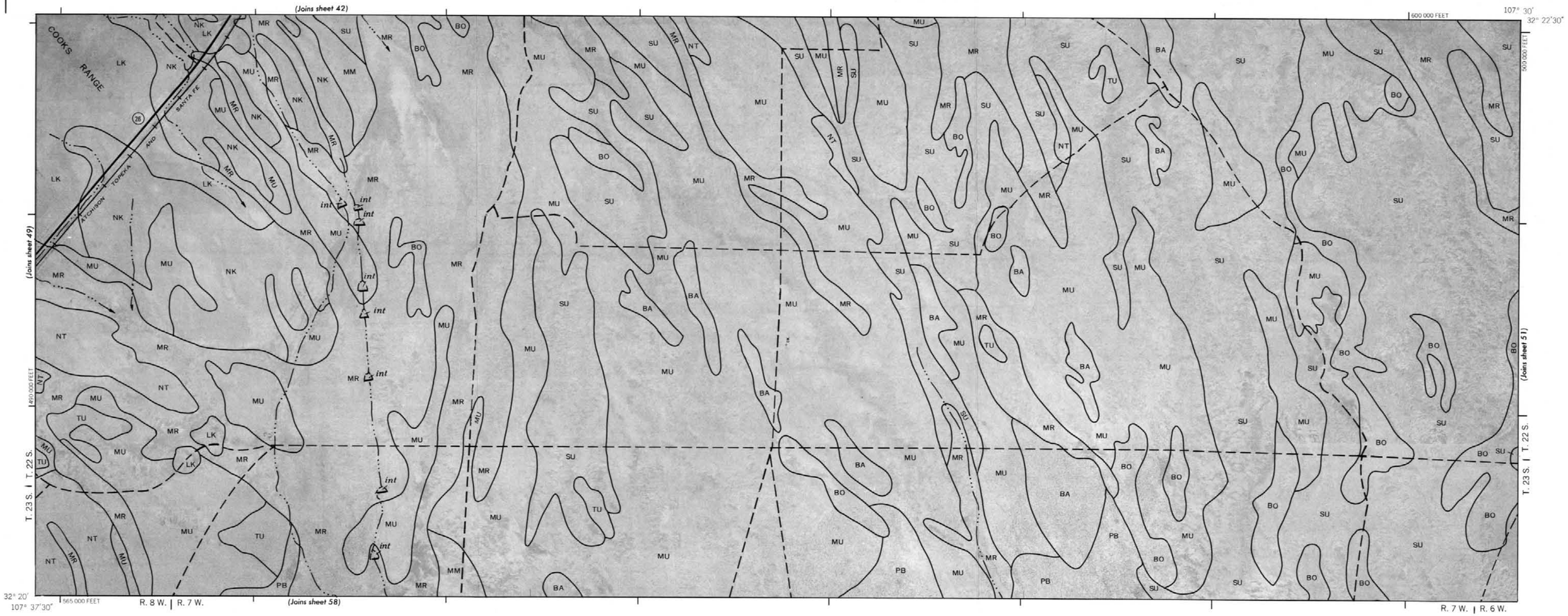


1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.



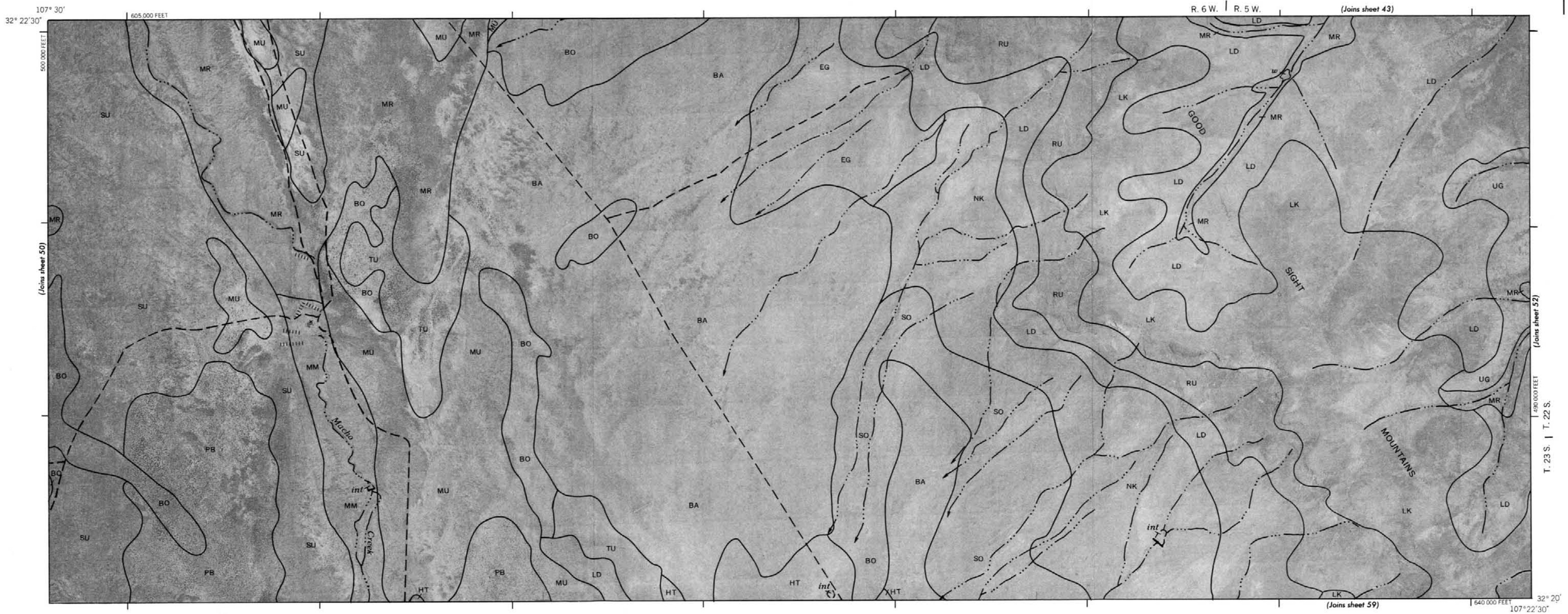
Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976. U.S. Department of The Interior, Geological Survey photophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.



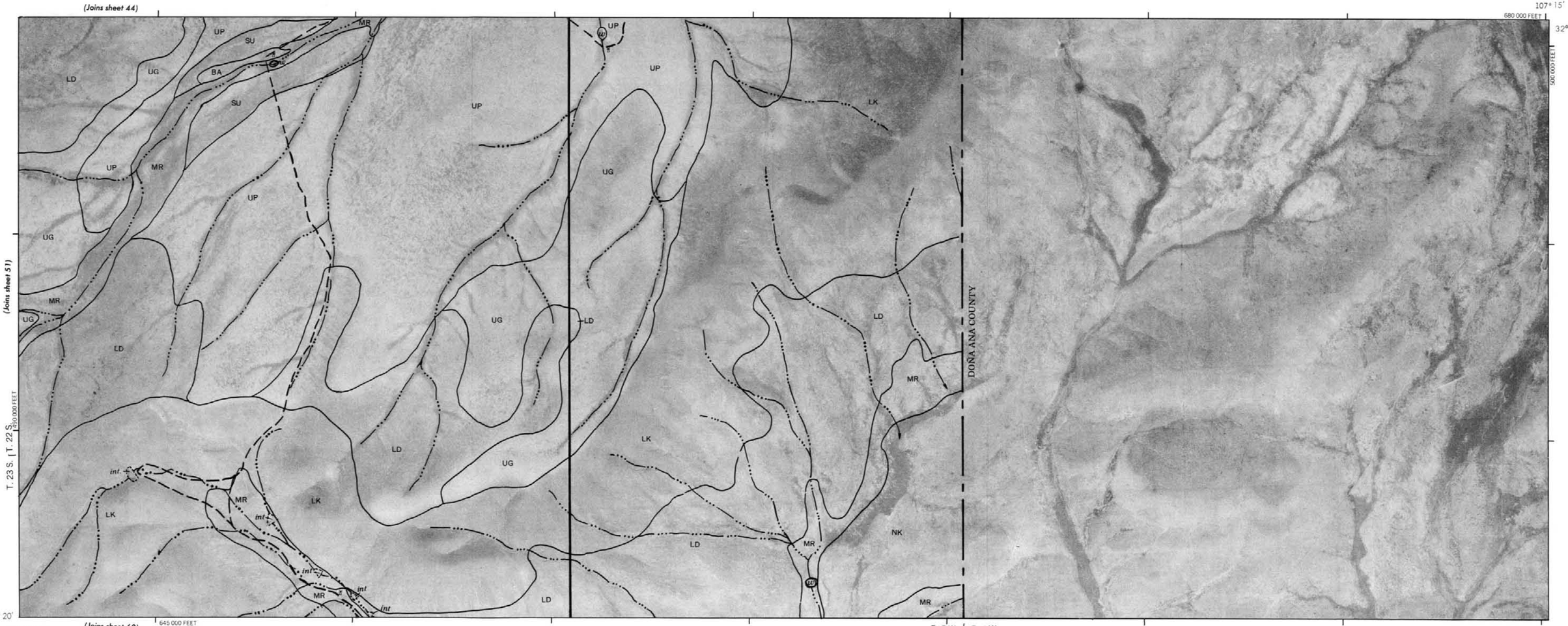
Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

N

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 52



Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

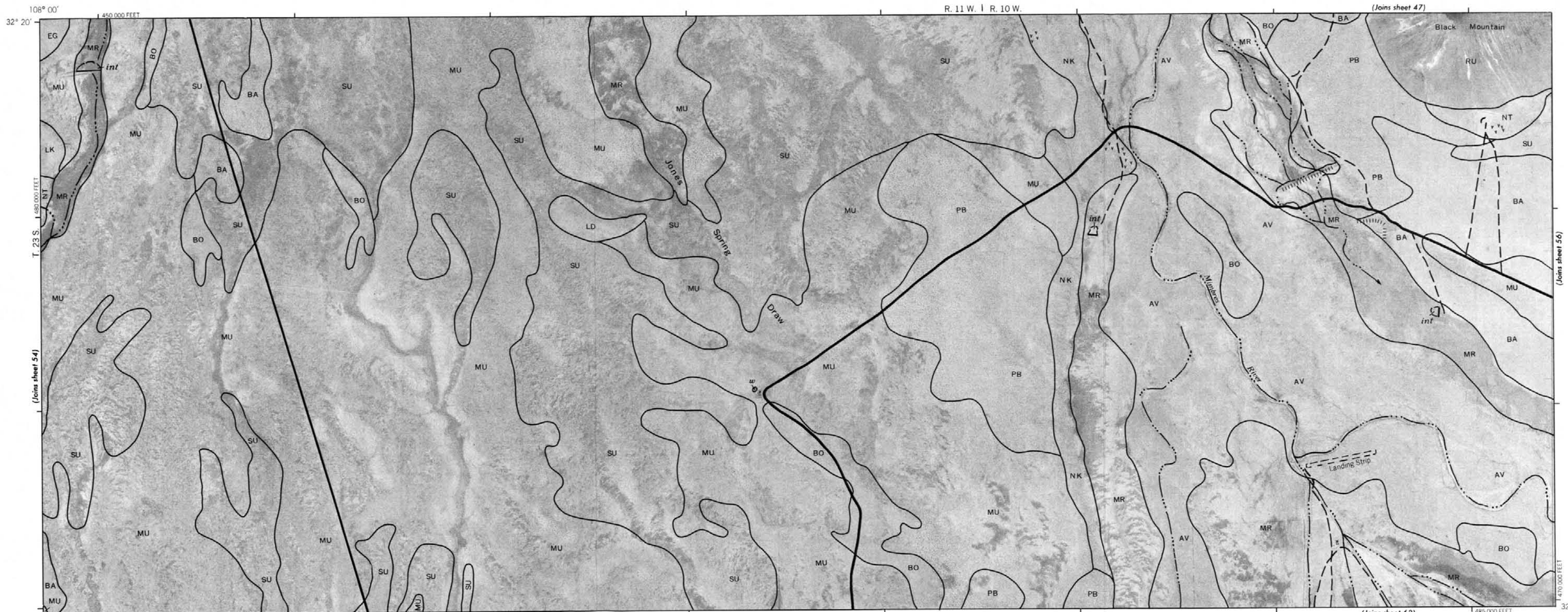
This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 54

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies



5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior Geological Survey photomosaic by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

107° 45'

530 000 FEET

R. 9 W. | R. 8 W.

TU (Joins sheet 49)

32° 20'

485 000 FEET

T. 23 S.

(Joins sheet 56)

(Joins sheet 58)

HT

470 000 FEET

32° 17' 30"

107° 37' 30"

(Joins sheet 65)

560 000 FEET

MU PB MR MM BA TU HT BO NT

Starvation Draw

SANTA FE AND TOPEKA ATCHISON

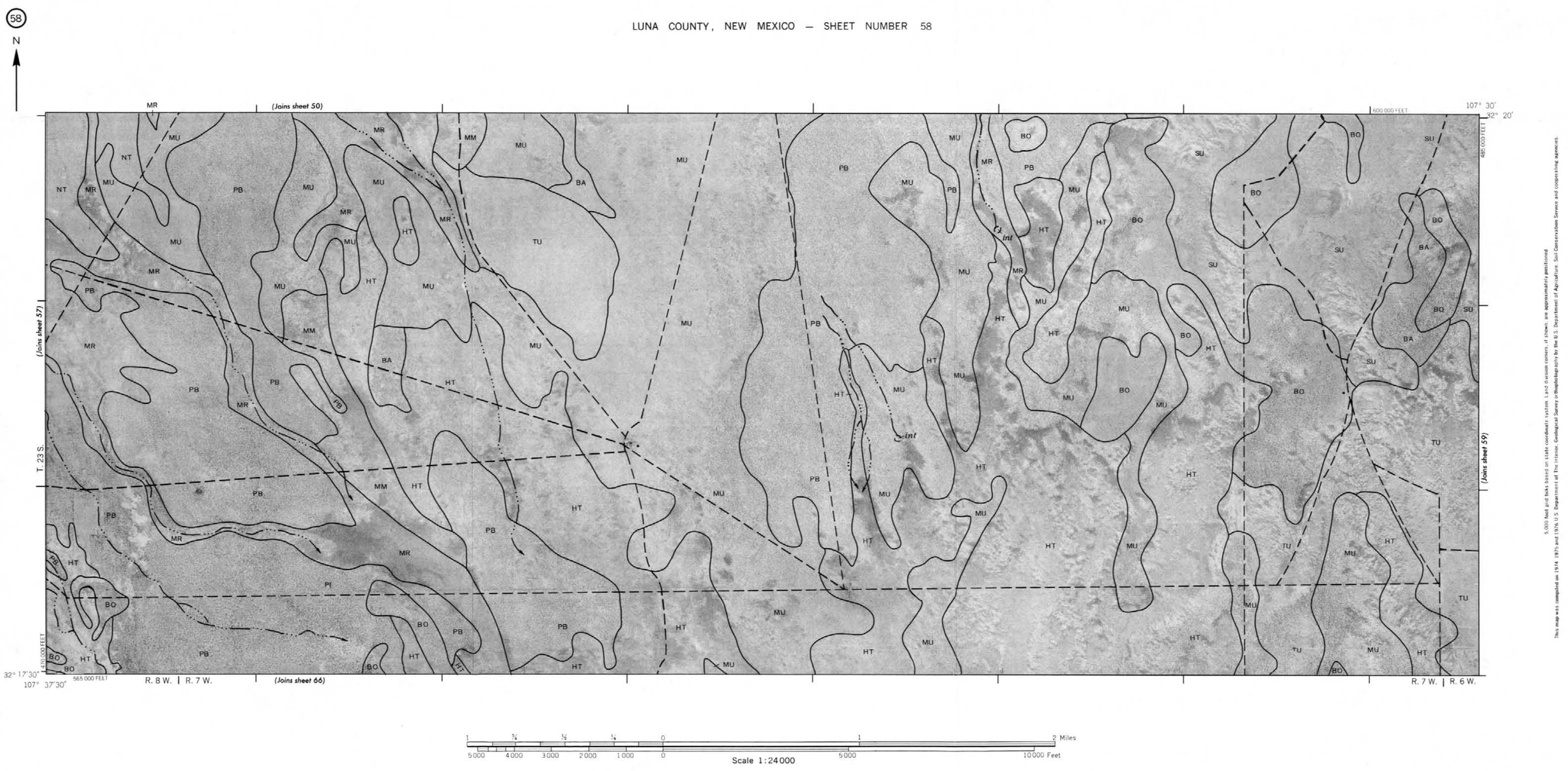
int

26

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000



This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000-foot grid ticks based on state coordinate system, Land division corners, as shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N

(Joins sheet 156)

R. 5 W.

INSET A

107° 15'

32° 47' 30"

680 000 FEET

287 000 FEET

(Joins inset A, sheet 5)

T. 29 S.

LK

PB

LK

LK

LK

PB

SO

LK

DOÑA ANA COUNTY

CHIHUAHUA REPUBLIC OF MEXICO

285 000 FEET

11° 46' 45"

107° 22' 30"

645 000 FEET

2000 AND 5000-FOOT GRID TICKS

675 000 FEET

107° 15'

32° 36' 30"

T. 20 S., T. 19 S.

(Joins sheet 5)

SIERRA COUNTY

585 000 FEET

MR

UG

MU

MR

MU

HT

BA

COUNTY

MU

SU

MU

DT

HT

MR

MU

SANTA FE

ANA

UG

MR

MU

BA

AND

SU

TU

MR

DT

TOPEKA

DT

MU

BO

DOÑA

ATCHISON

HT

32° 35'

107° 22' 30"

(Joins sheet 12)

645 000 FEET

R. 5 W.

R. 4 W.

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975, and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

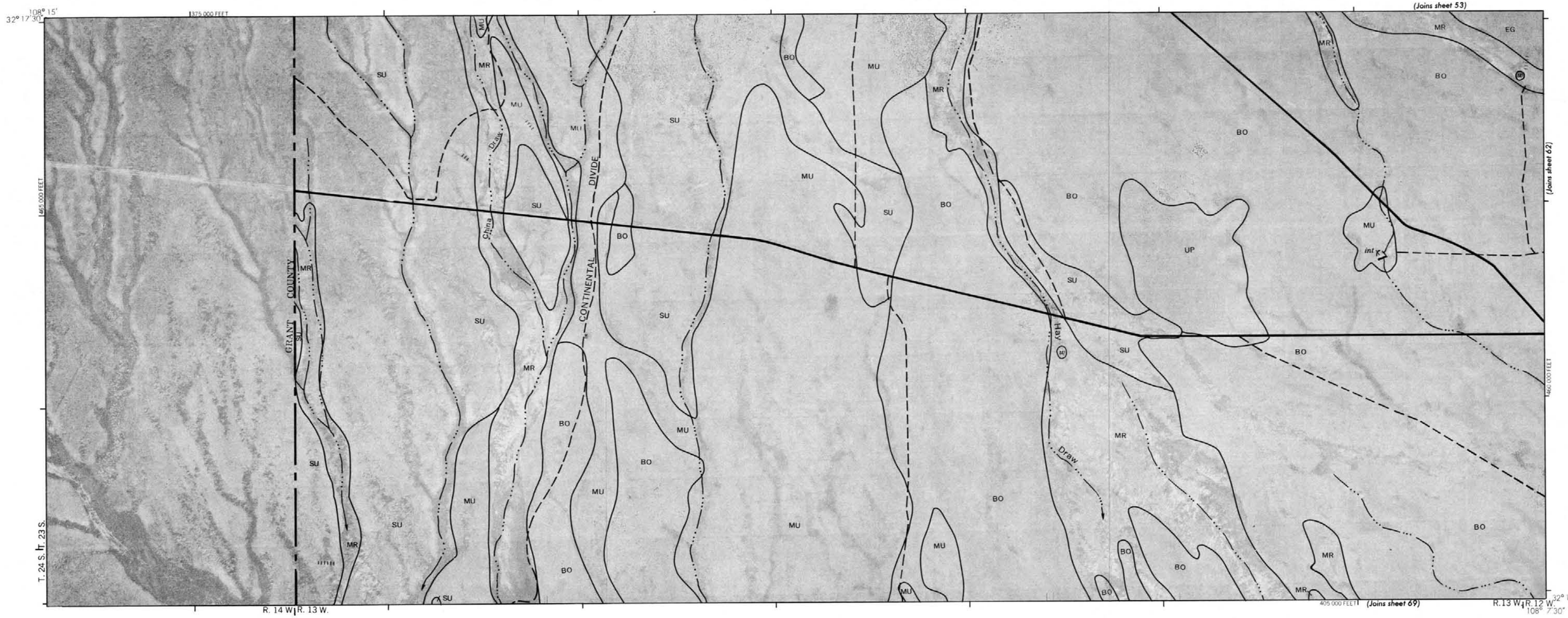
Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.



1 ¾ ½ ¼ 0 1 2 Miles

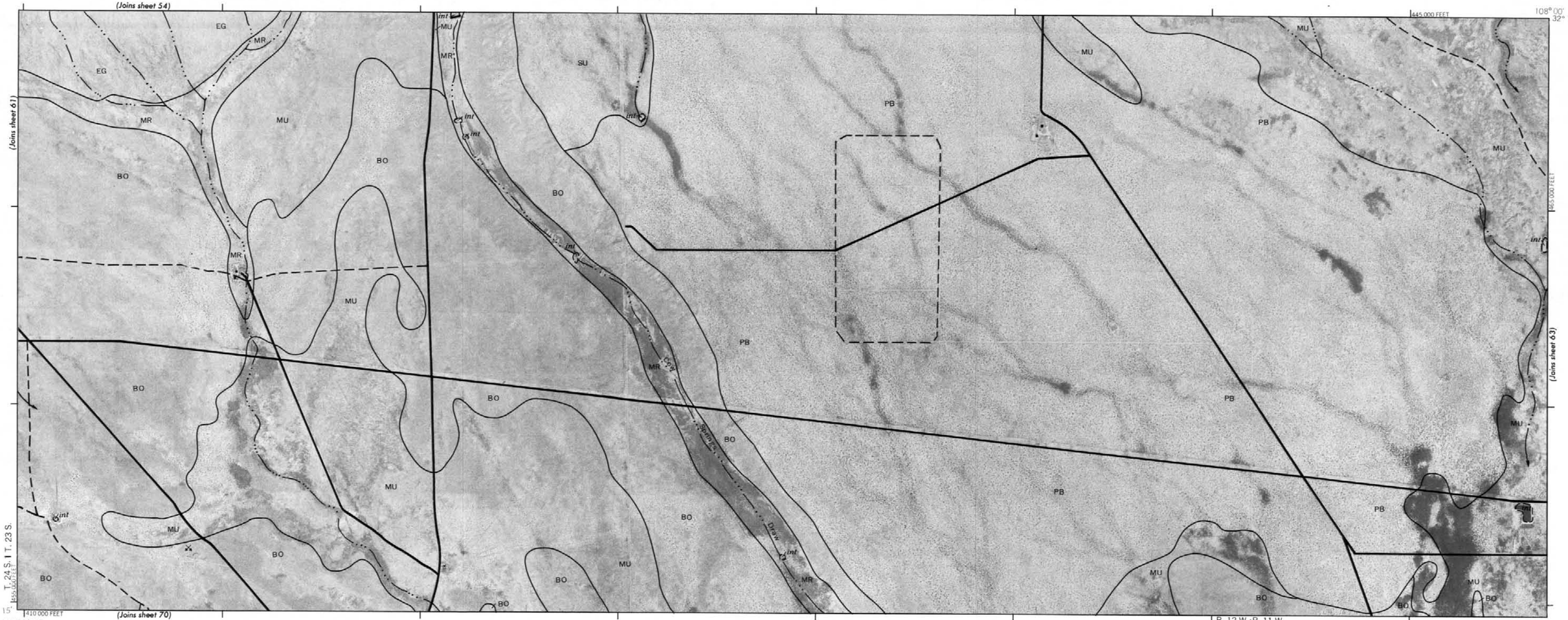
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974. 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 62

N



Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles

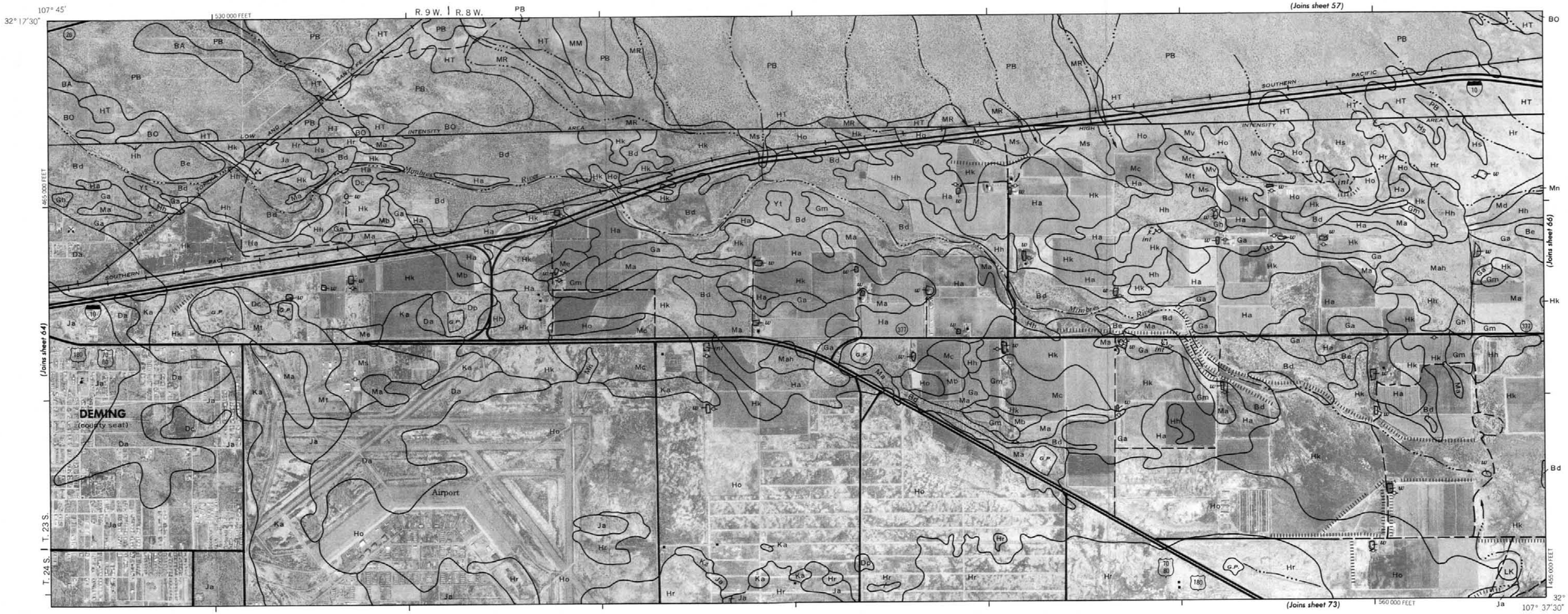
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975, and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

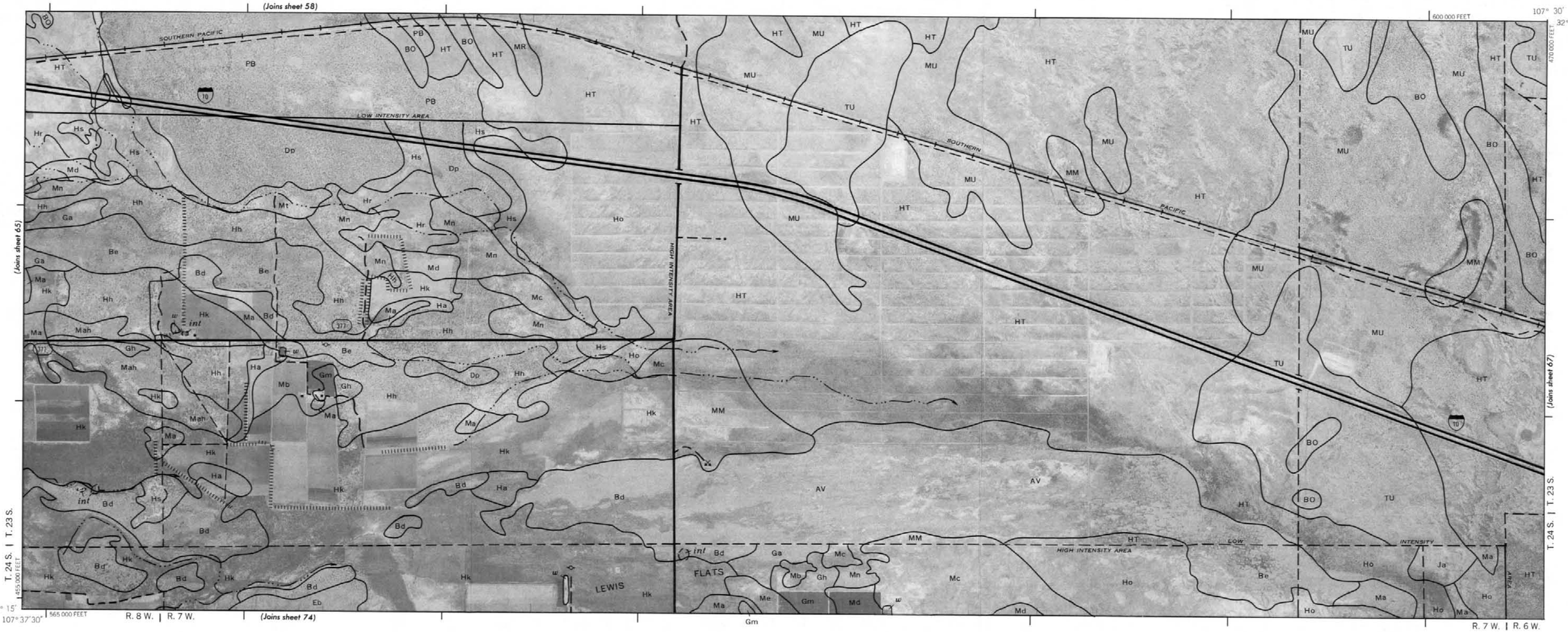
N



Scale 1:24000

1 Mile 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

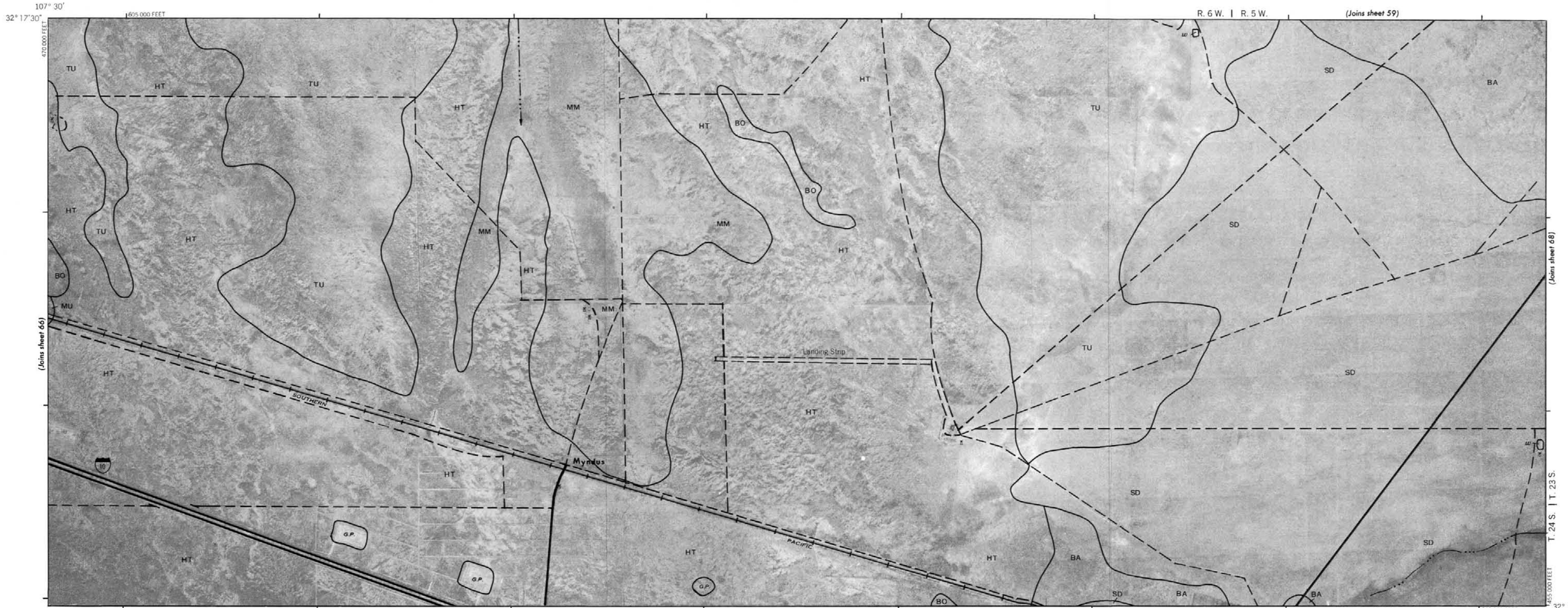


1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N



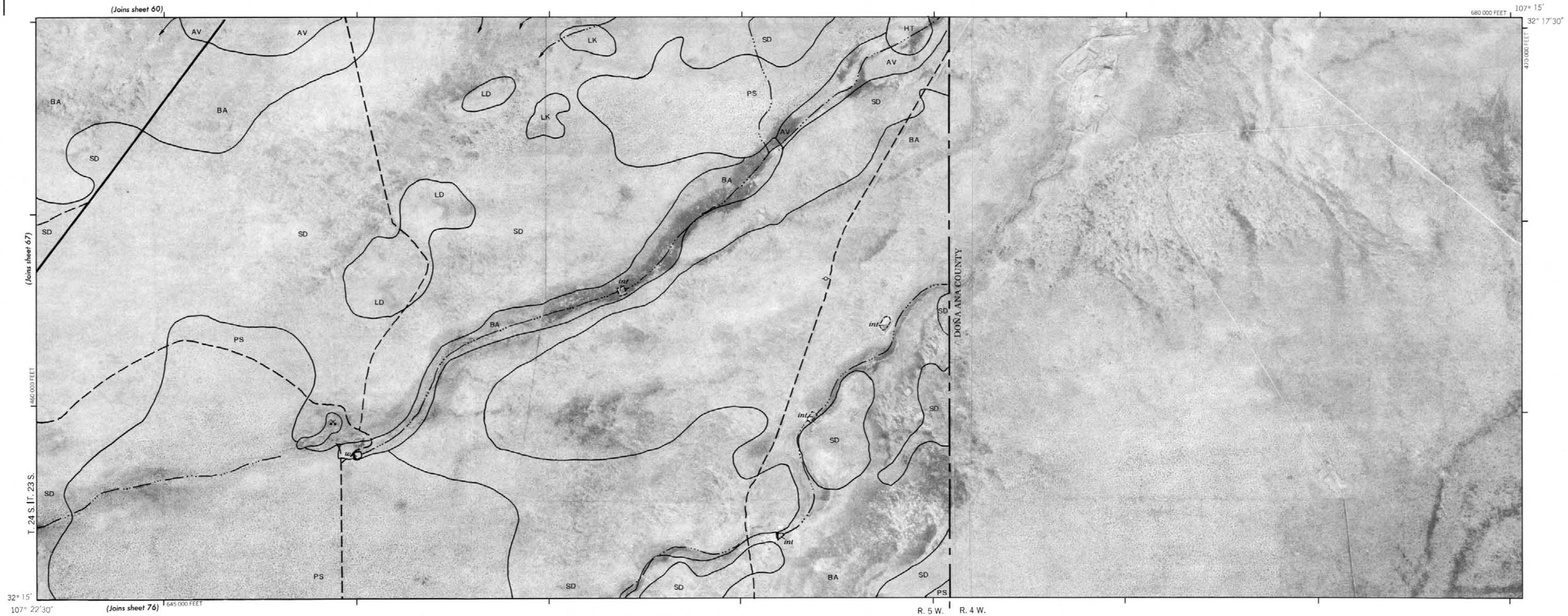
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1971 1975 and 1976. U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N



1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

5,000 foot grid ticks based on state coordinate system, Land division corners, if shown, are approximately positioned.

N

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. 5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

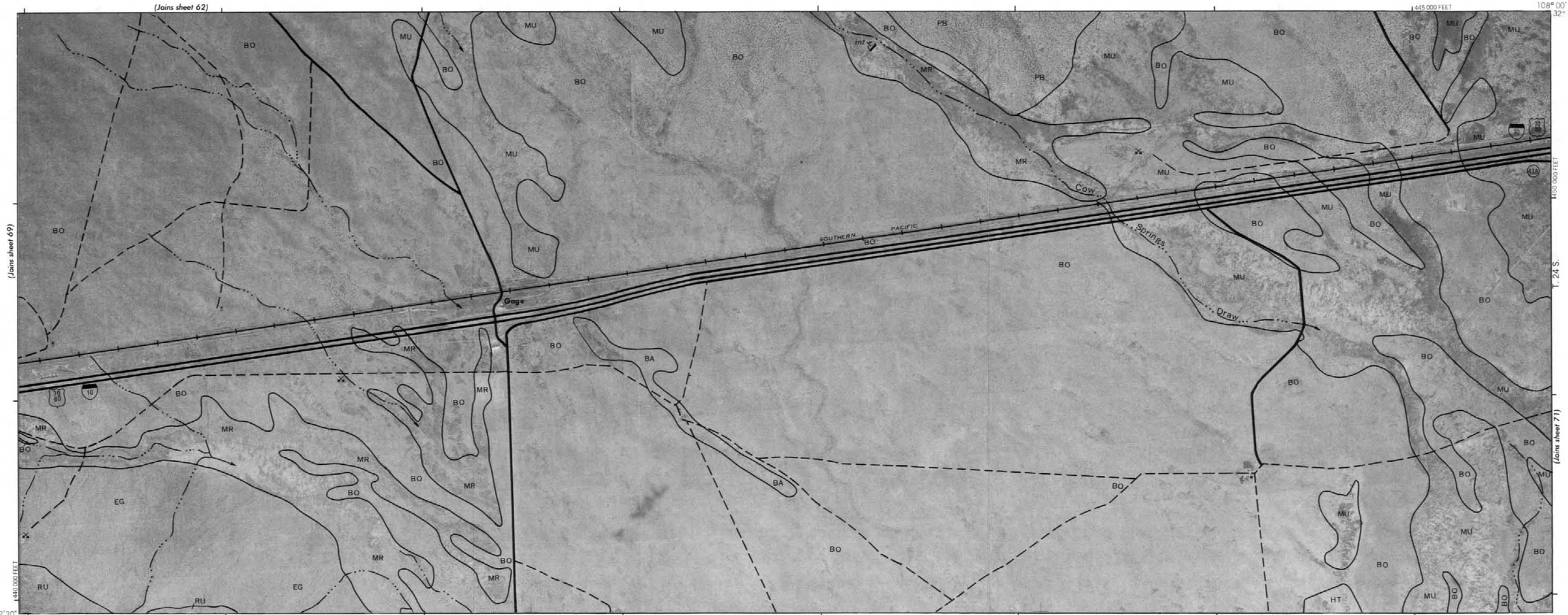
N

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

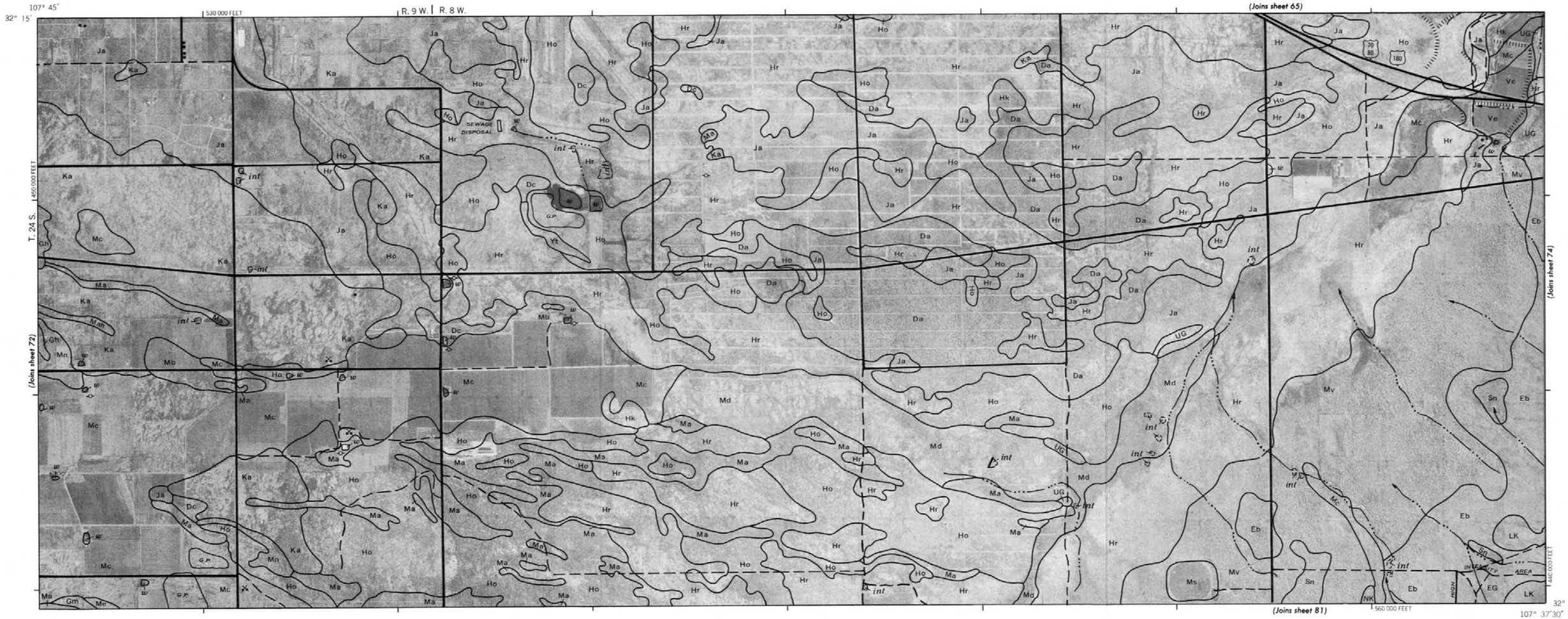
This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotographs by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N



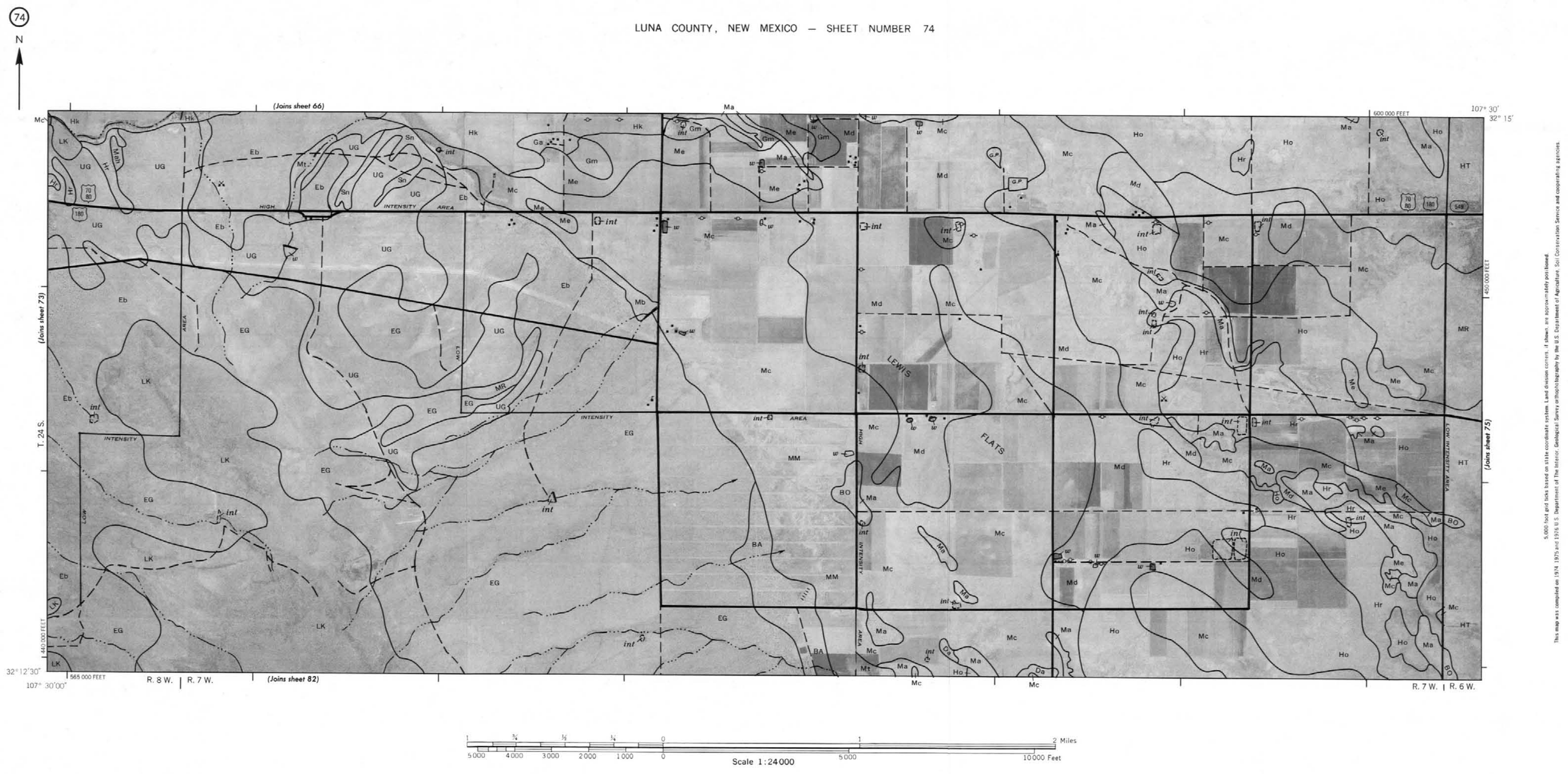
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1973 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 74



Scale 1:24000

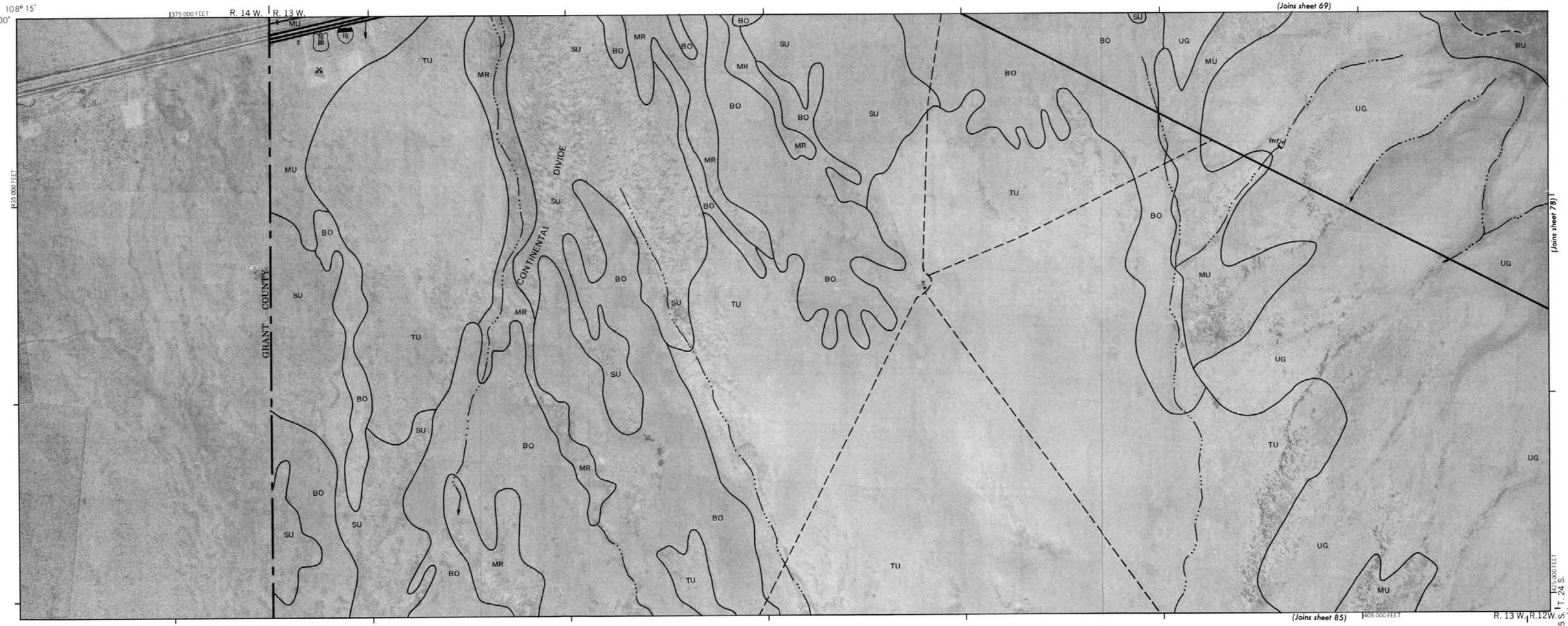
1 3/4 1/2 1/4 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1924, 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

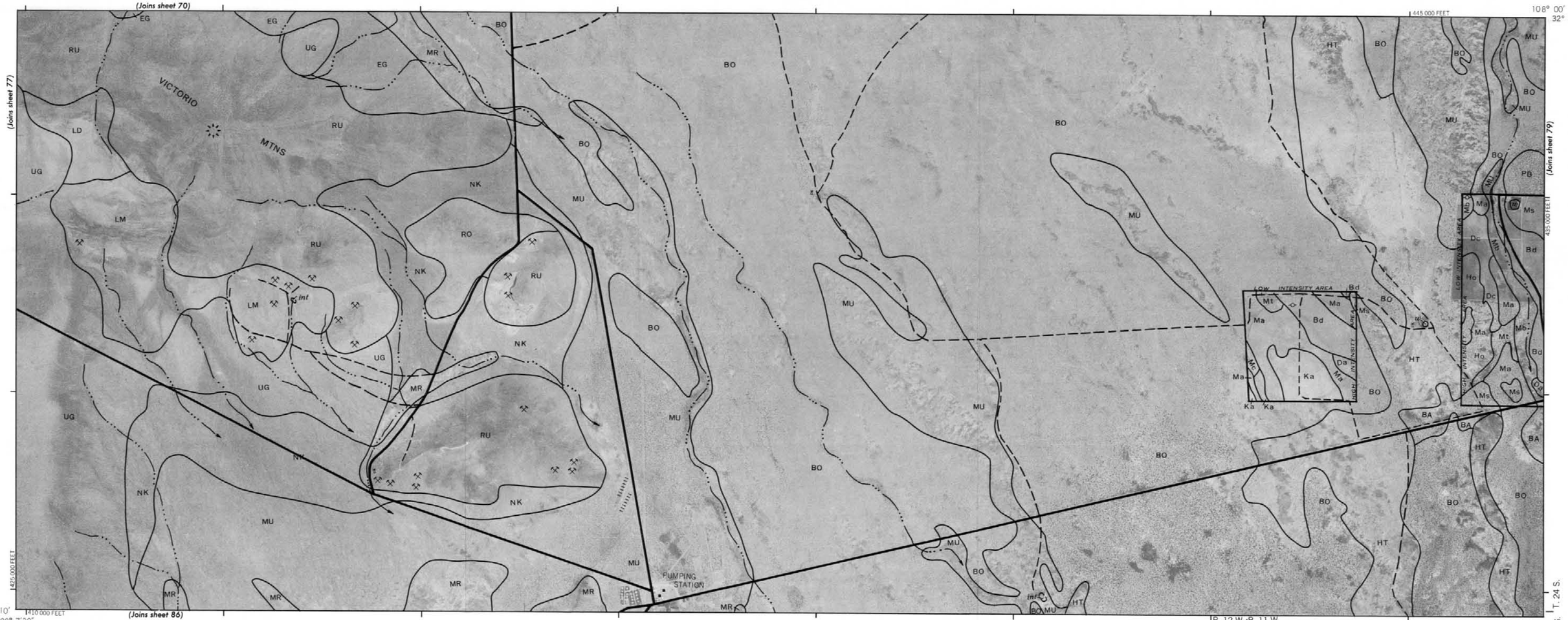
N



78

N

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 78



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 8

N

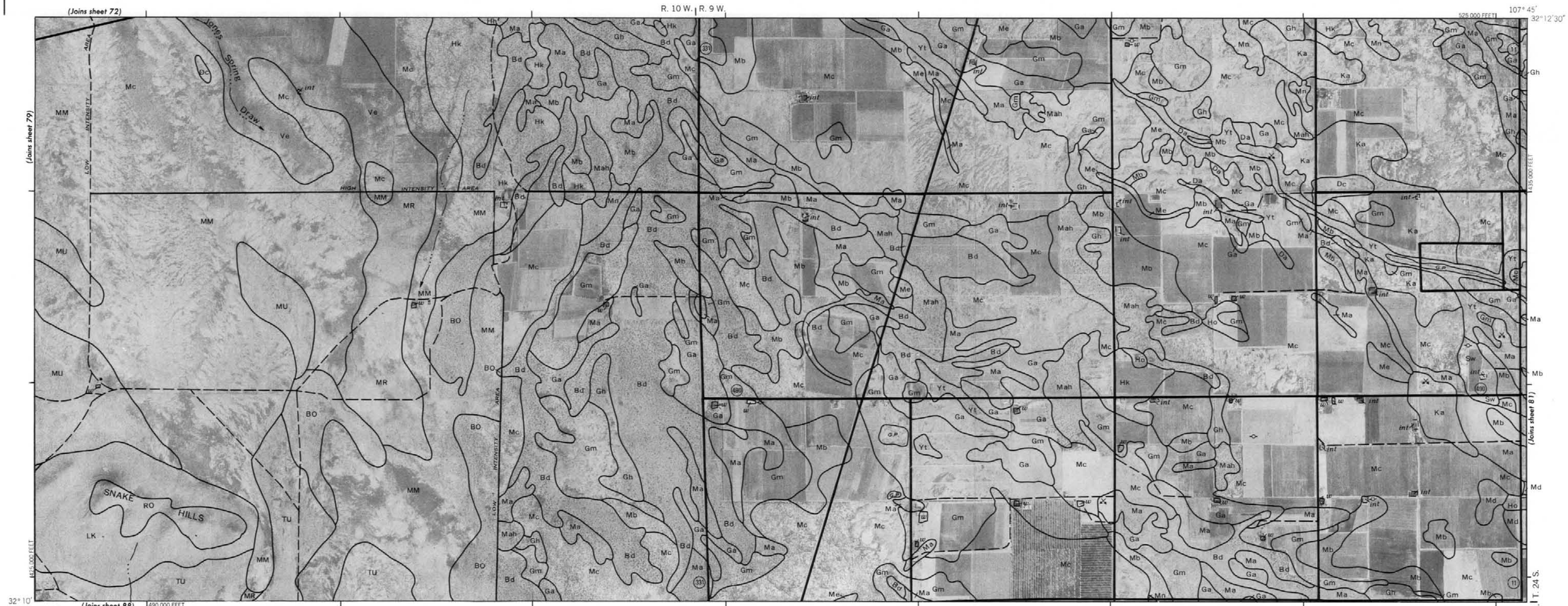
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974, 1975, and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

N



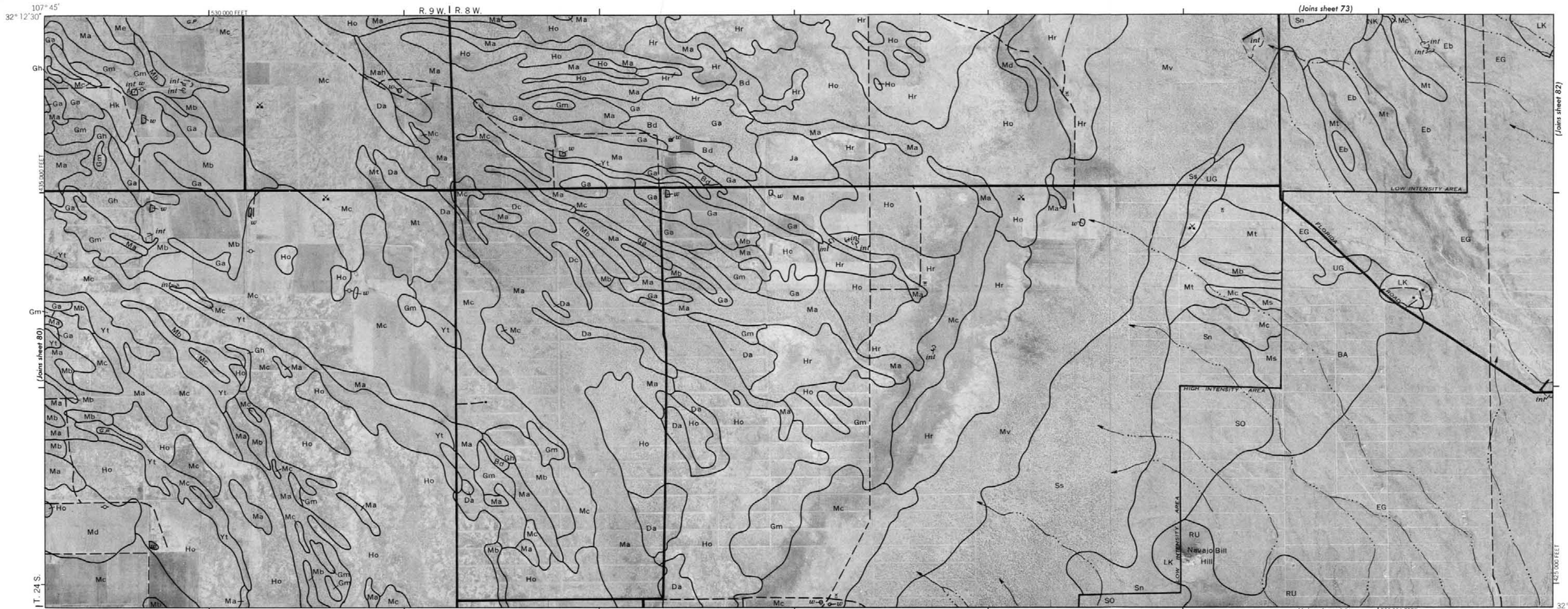
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

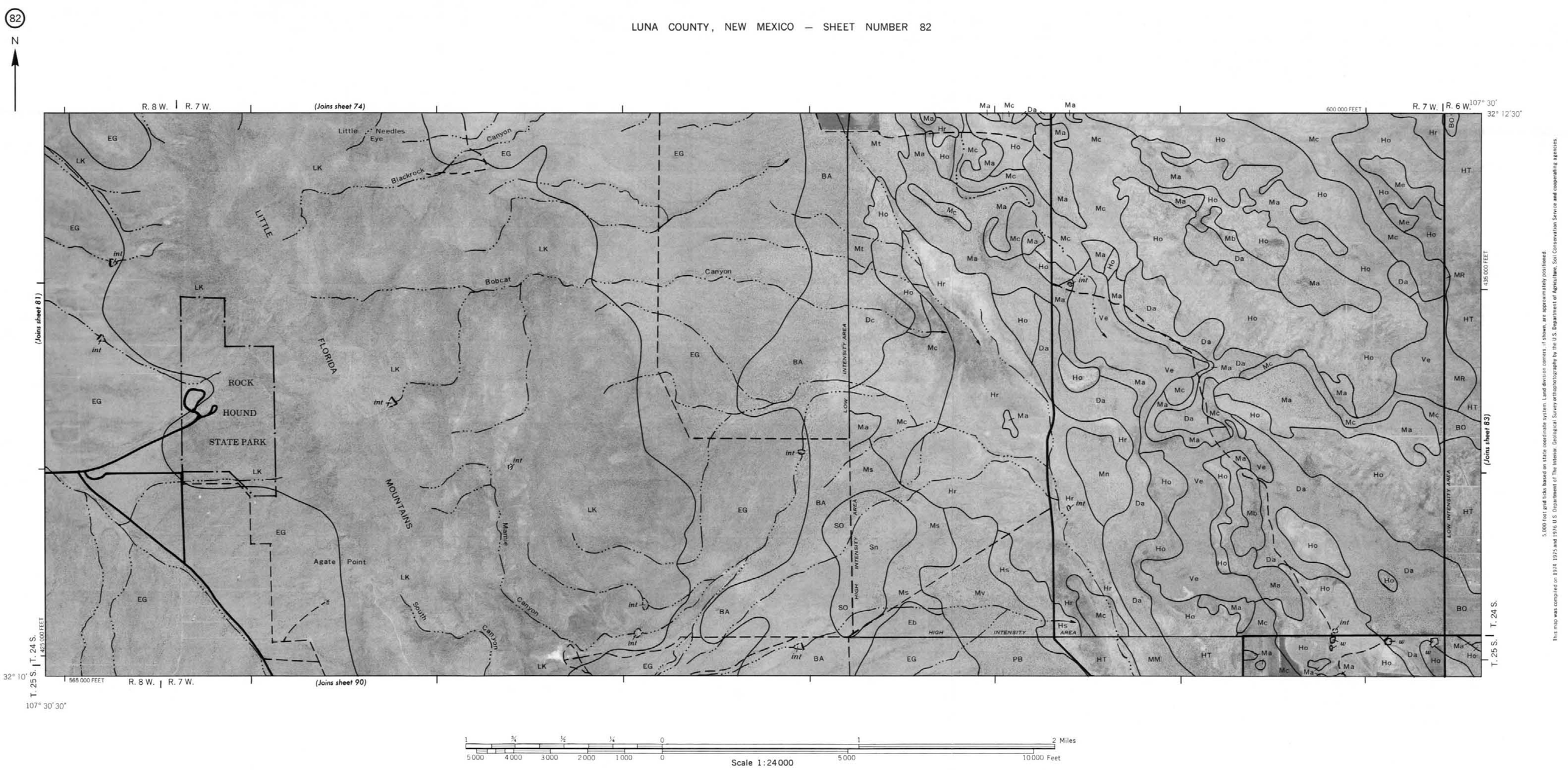
Scale 1:24000

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.



LUNA COUNTY, NEW MEXICO — SHEET NUMBER 82



5,000 foot grid ticks based on state coordinate system. Land division corners - if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

107° 30'
32° 12'30"
605 000 FEET
435 000 FEET
R. 6 W.
R. 5 W.
T. 24 S.
T. 25 S.
32° 10'
640 000 FEET
107° 22'30"

(Joins sheet 79)
(Joins sheet 84)
(Joins sheet 82)
(Joins sheet 91)

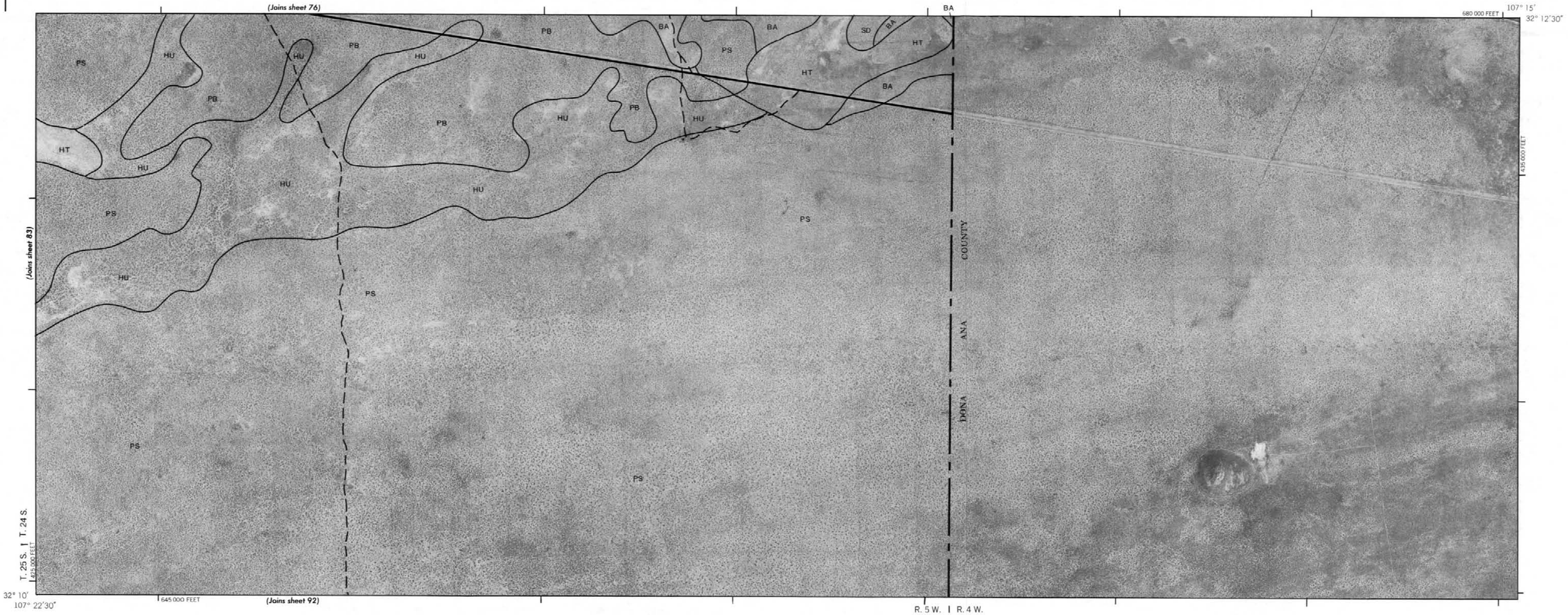
BO HT HU PS BA SD Ho Ma Hr Hs Da Md Mc int

LOW INTENSITY AREA HIGH INTENSITY AREA

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 84

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned

N

108°15'
32° 10'
375 000 FEET
R. 14 W.
R. 13 W.
(Joins sheet 77)
R. 13 W.
R. 12 W.
T. 25 S.
420 000 FEET
GRANT COUNTY
(Joins sheet 86)
Seventysix Draw
410 000 FEET
405 000 FEET
(Joins sheet 93)
32° 7'30"
108° 7'30"

SU BO MR TU HT UP LD NK MU UG

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

N

Scale 1:24000

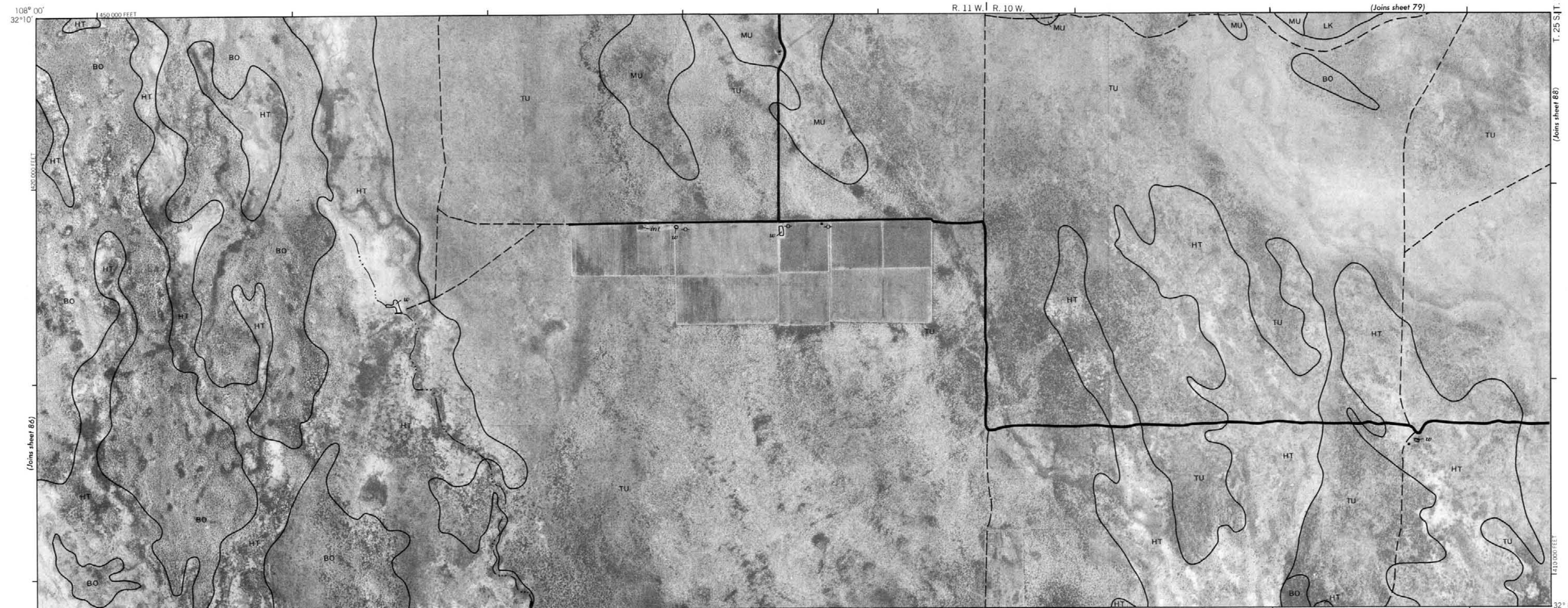
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

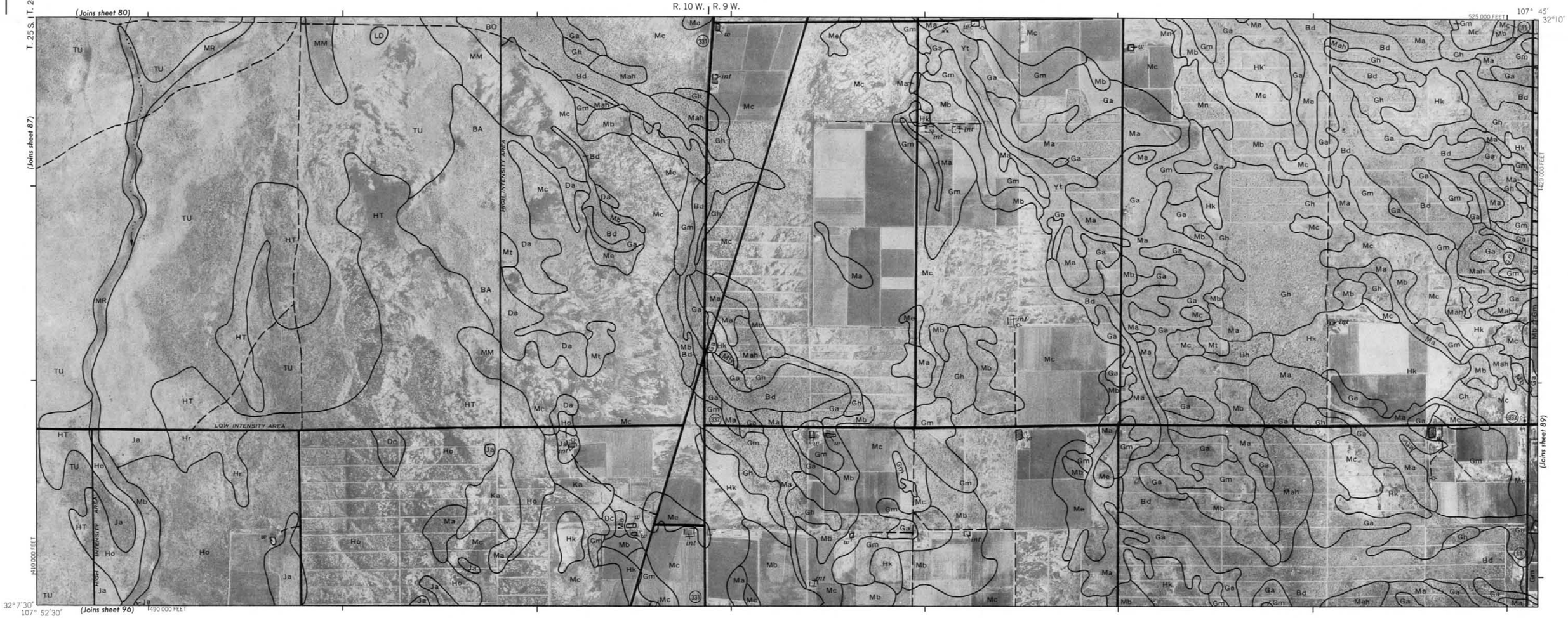
N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000



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N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N

2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

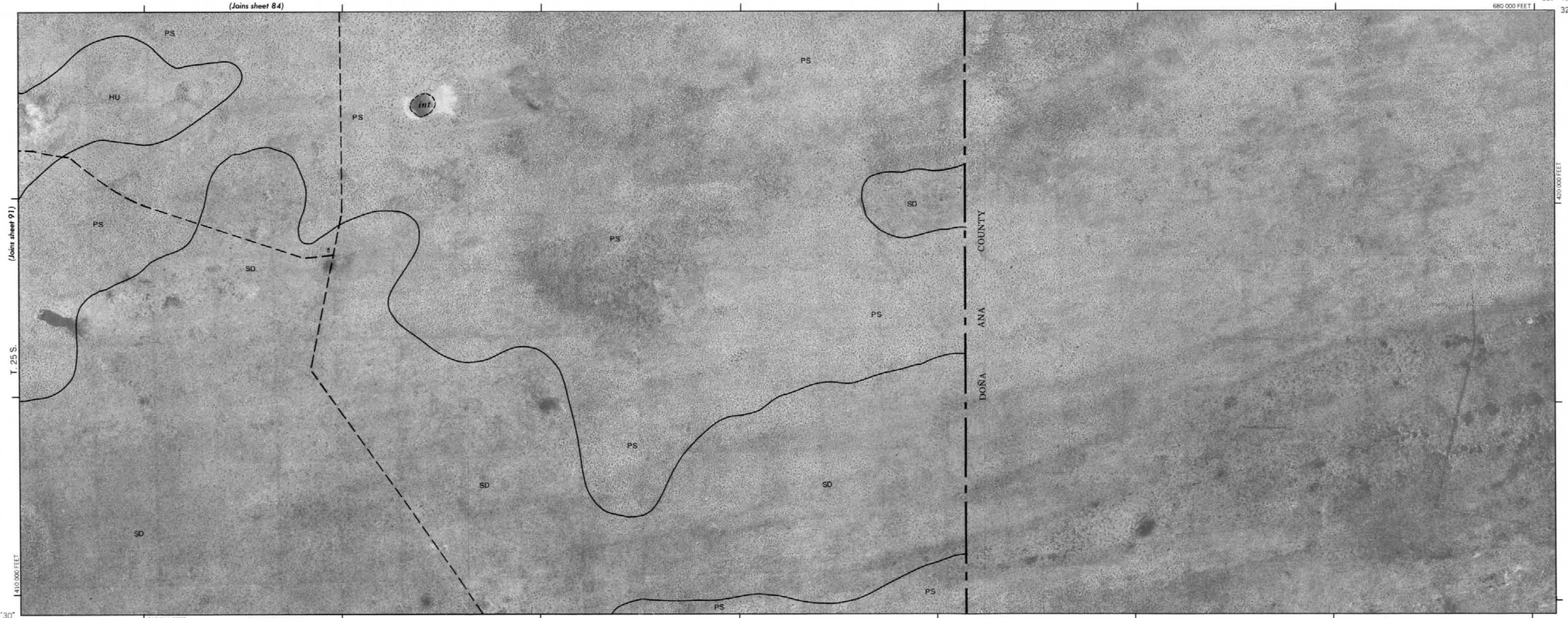
N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior, Geological Survey photobase map by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 94

N

Scale 1:24000

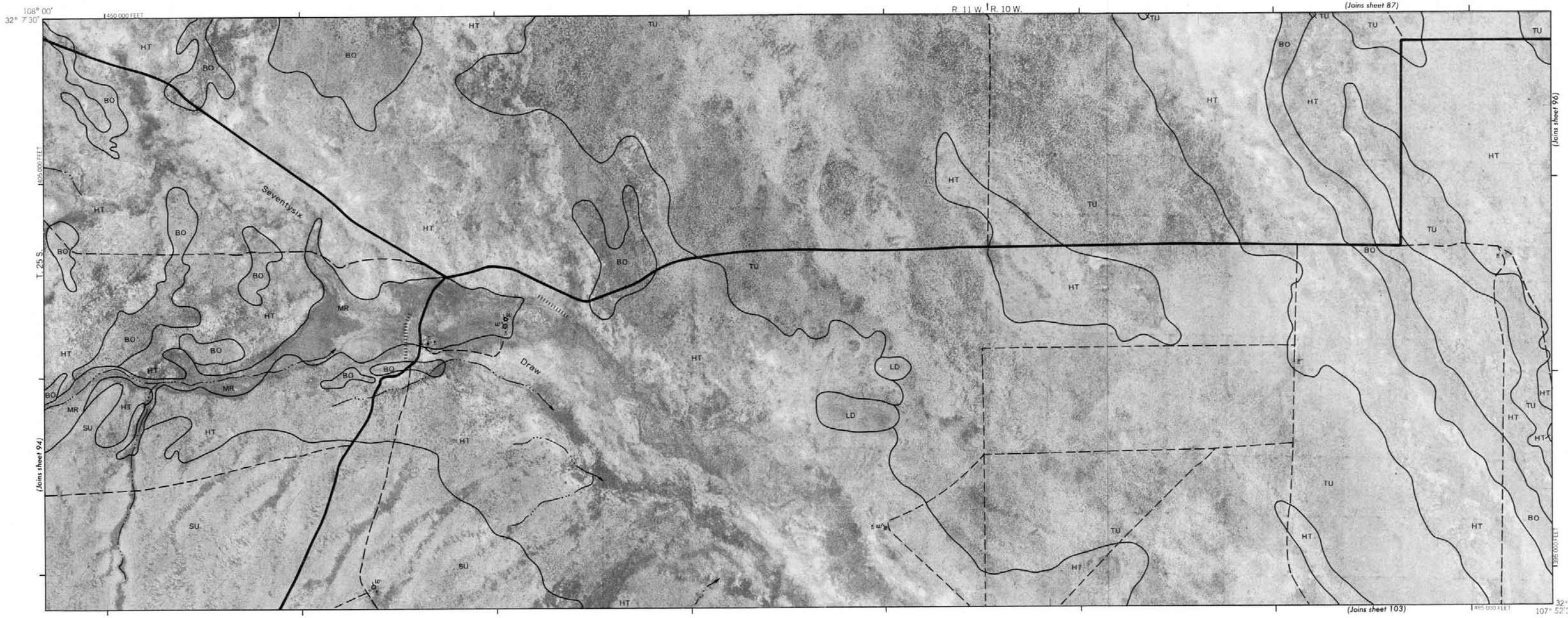
1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior Geological Survey orthophotography by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies.

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

LUNA COUNTY, NEW MEXICO — SHEET NUMBER 96

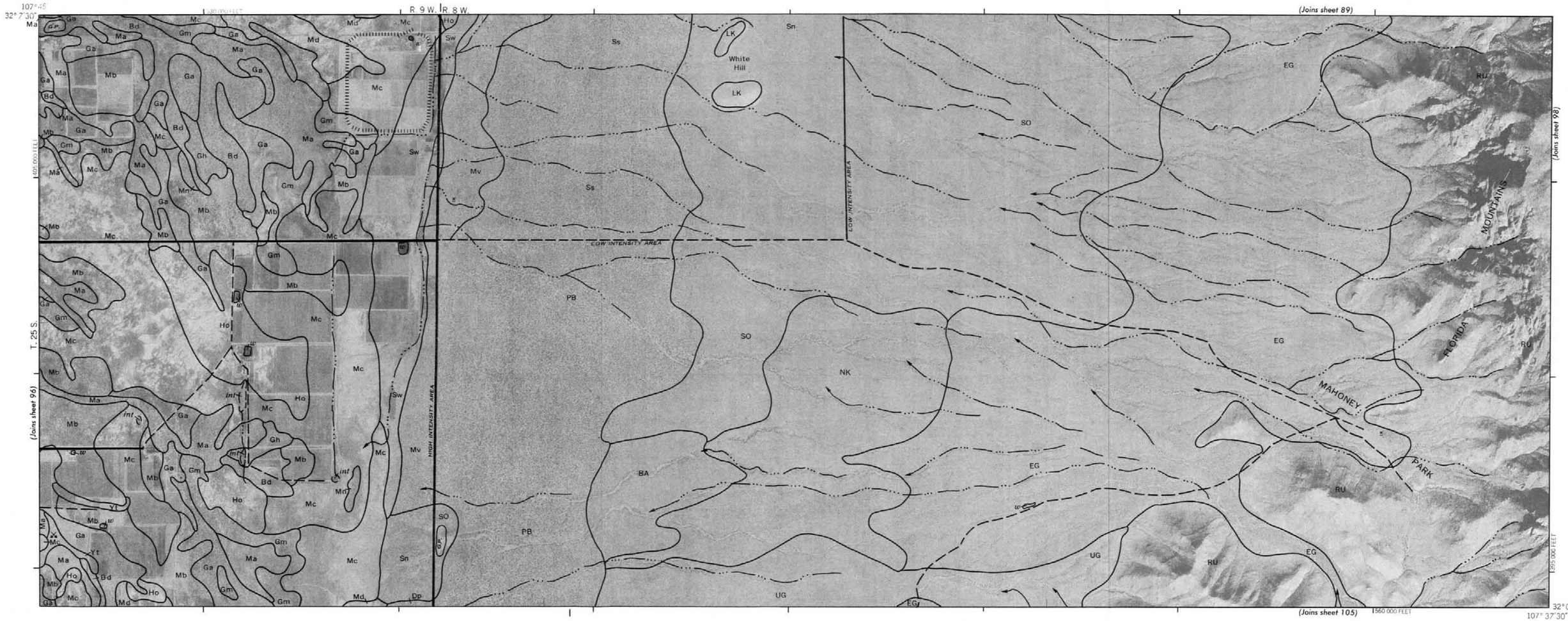
Scale 1:24000

5000 4000 3000 2000 1000 0 5000 10000 Feet

1 ¾ ½ ¼ 0 1 2 Miles

5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of the Interior, Geological Survey or Photogeography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

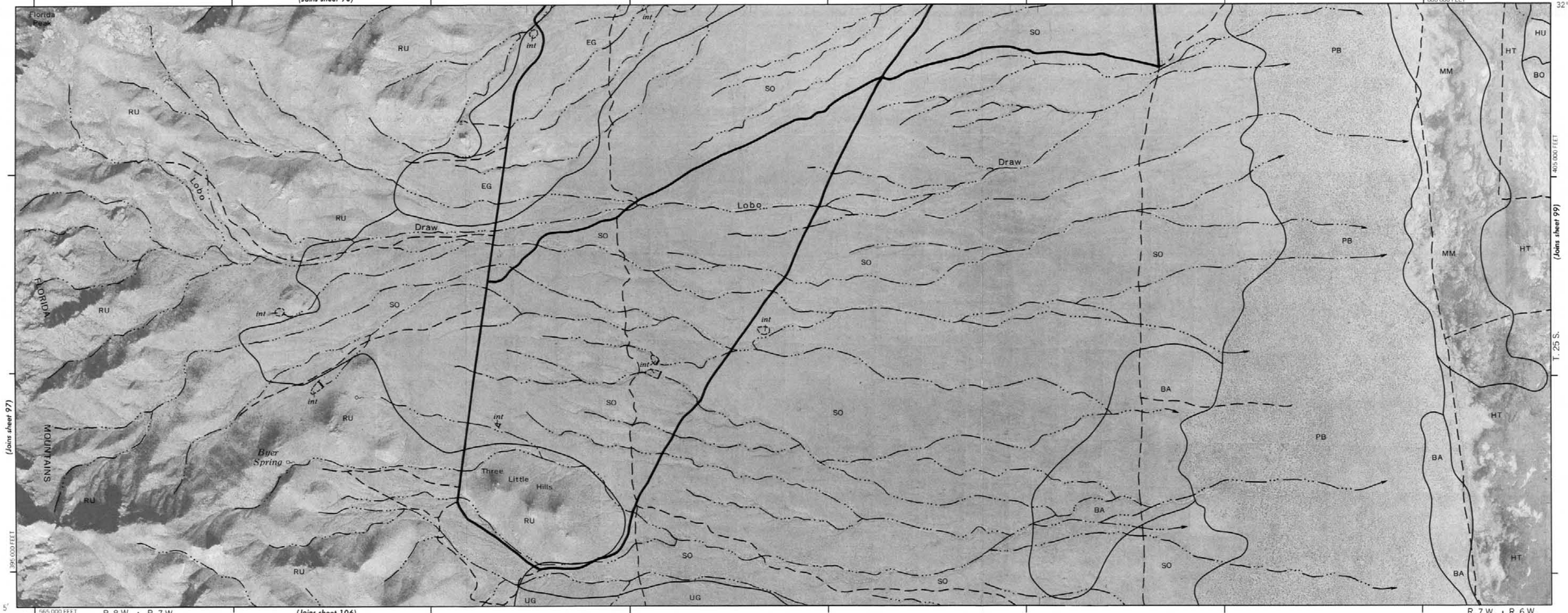


Scale 1:24000

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

5,000-foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

This map was compiled on 1974 1975 and 1976 U.S. Department of The Interior Geological Survey or Photogrammetry by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies.

N

107° 30'
32° 7'30"
605 000 FEET
405 000 FEET
R. 6 W.
R. 5 W.
(Joins sheet 91)
T. 25 S.
(Joins sheet 98)
(Joins sheet 100)
(Joins sheet 107)
325 000 FEET
640 000 FEET
32° 5'
107° 22'30"

HT HU BO UG PS SD

Sibley Hole

int

Brushy Tank

This map was compiled on 1974, 1975 and 1976 U.S. Department of The Interior, Geological Survey orthophotography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
5,000 foot grid ticks based on state coordinate system. Land division corners, if shown, are approximately positioned.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000